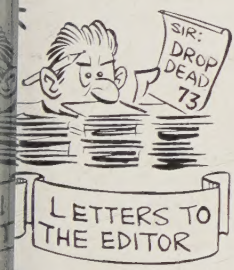
JULY
1956
50c

CQ RADIO AMATEURS' JOURNAL



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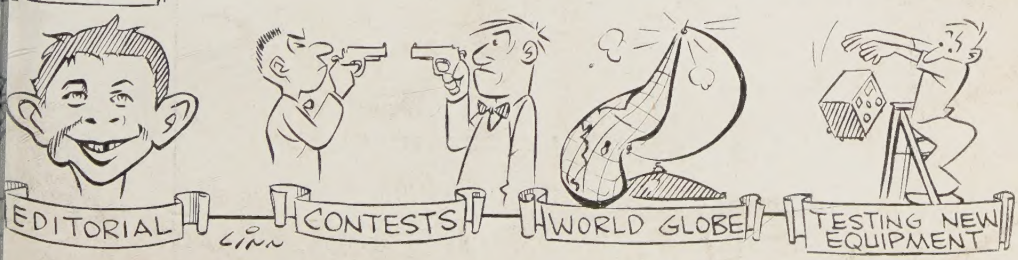
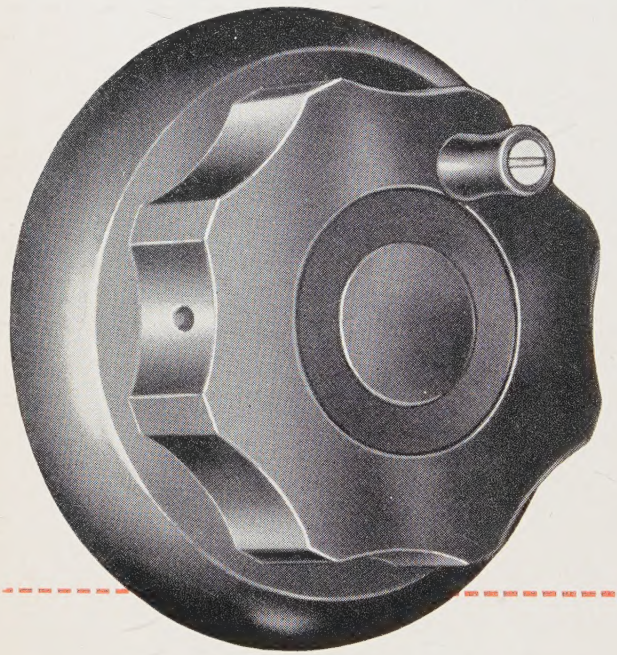


ANNOUNCING

Collins Gear Reduction Tuning Knob for

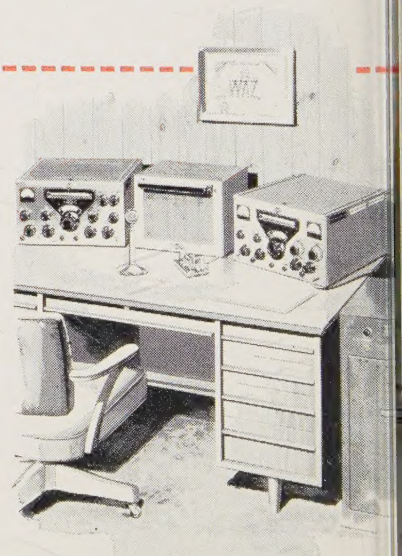
new fine tuning



New ease and accuracy in Sideb tuning are featured in Collins G Reduction Tuning Knob for 75A-4 and KWS-1.

Operating on a 4 to 1 ratio, this q ity accessory to the top SSB tra mitter-receiver team eliminates Dial Drag and has no detectable ba lash. After simple installation, yo experience smoothness unsurpas in tuning any type signal—SSB, C or AM. The Knob is also adapta for best tuning of the earlier mod in the 75A series.

Available soon at your nearest tributor—$15.00.



It's easy, smart to own Collins

You can now operate the finest SSB station while taking up to 18 months to pay small installments. This is a *sound investment* with Collins' consistently top trade-in value and the resulting low cost per day. Ask your Collins distributor for the figures today.

Visit Collins exhibit at the National ARRL Convention in San Francisco July 6, 7 and 8.

Collins CREATIVE LEADER IN COMMUNICATION

COLLINS

Wayne Green, W2NSD Editor

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HEATHKIT

DX-100

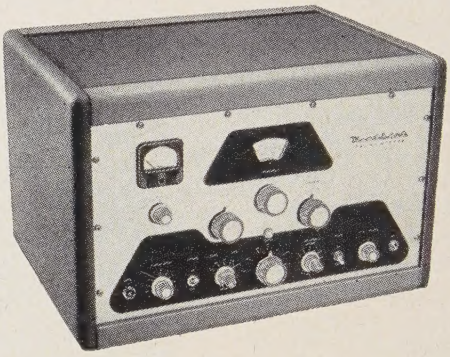
PHONE AND CW

transmitter

KIT

The Heathkit Model DX-100 Transmitter is rapidly b coming the "standard" ham rig in its power class. T high quality and outstanding performance it offers can matched only in equipment costing many dollars more. features a built-in VFO, modulator, and power supplie and is bandswitching for phone or CW operation on 16 80, 40, 20, 15, 11, and 10 meters. The kit includes a d tailed construction manual, the cabinet, all tubes, pr wound coils, and all other parts necessary for constructio

Push-pull 1625 tubes are used to modulate parall 6164 tubes for RF output in excess of 100 watts on phon and 120 watts on CW. May be excited from the built- VFO or from crystals. Features pi network output circu illuminated VFO dial and meter face, and 5-point TV suppression. High grade, well-rated parts supplied. Sch matic diagram and technical specifications on request.



MODEL DX-100

$189.50

Shpg. Wt. 107 Lbs.

Shipped Motor Freight unless otherwise specified. $50.00 deposit required on all C.O.D. orders.

FEATURES

Design proven through actual signal reports.

★

Only top-quality components used throughout.

★

5-point TVI suppression, and pi network output to match 50 to 600 ohms.

★

Detailed construction manual for simplified assembly.

★

100 watts output on 160, 80, 40, 20, 15, 11, and 10 meters.

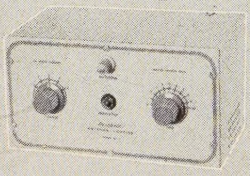
★

Attractive and functional physical design.

HEATHKIT

antenna coupler

KIT



MODEL AC-1

$14.50

Shpg. Wt. 4 Lbs.

In addition to matching a low power transmitter to an end-fed long wire antenna, this antenna coupler incorporates a 3-section low-pass filter, to attenuate output above 36 mc and reduce TVI. Handles up to 75 watts, 10 through 80 meters. 52 ohm coaxial input—tapped inductor and variable capacitor—neon RF indicator. Ideal for use with the Heathkit AT-1 Transmitter.

HEATHKIT

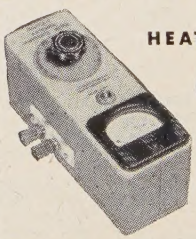
grid dip meter KIT

The Model GD-1B is a time-proven instrument. It will enable you to accomplish literally hundreds of jobs on all types of equipment. Frequency range is from 2 mc to 250 mc. A 500 ua meter is employed for indication, and a sensitivity control and headphone jack are provided. Includes pre-wound coils and rack. Indispensable for the ham, serviceman, and engineer. Extra coils available to extend frequency down to 350 kc.

MODEL GD-1B

$19.50

Shpg. Wt. 4 Lbs.



HEATHKIT

antenna impedance meter KIT

MODEL AM-1

$14.50

Shpg. Wt. 2 Lbs.

Used with an RF signal source, the AM-1 will enable you to match your antenna-receiver-transmitter system for optimum operation. Will double as a phone monitor or relative field strength meter. Uses 100 ua meter, and covers 0 to 600 ohms. Frequency to 150 mc.

HEATH COMPANY

A Subsidiary of Daystrom, Inc.

BENTON HARBOR 12, MICHIGAN

HEATHKIT communications-type all band receiver KIT

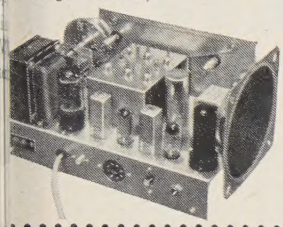
Slide-rule dial —electrical bandspread—ham bands marked.

Slug-tuned coils and efficient IF transformers for good sensitivity and selectivity.

Transformer-operated power supply for safety and high efficiency.

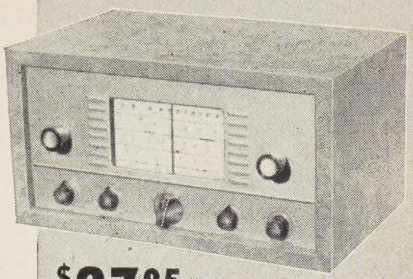
The Model AR-3 receiver features new high-Q slug-tuned coils, new layout, and new-type IF transformers. The result is high sensitivity and selectivity and better image rejection on all bands.

Transformer-type power supply, electrical bandspread, RF and AF gain controls, antenna trimmer, AGC, BFO, headphone jacks, socket for Q multiplier, 5½" PM speaker and illuminated dial.



SPECIFICATIONS:

Frequency Range—550 kc to 30 mc on four bands. **Tube Complement**—1—12BE6 oscillator and mixer • 1—12BA6 IF amplifier • 1—12BA6 second detector, AVC, first audio amplifier and reflex BFO • 1—12A6 beam power output • 1—5Y3 full wave rectifier



$27.95 (Less Cabinet) • **MODEL AR-3**
Shpg. Wt. 12 Lbs.

CABINET: Fabric-covered cabinet available. Includes aluminum panel, speaker grille, and protective rubber feet. Measures 12¼" W. x 6¾" H. x 7¾" D. No. 91-15. Shpg. Wt. 5 Lbs. **$4.50.**

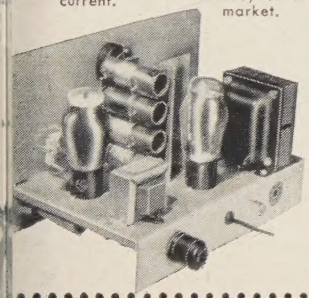
HEATHKIT CW amateur transmitter KIT

Single-knob bandswitching for 80, 40, 20, 15, 11, and 10 meters.

Panel meter monitors final grid or plate current.

Plate power input 25-30 watts.

Best dollar-per-watt buy on the market.



The AT-1 is complete with its own power supply, and covers 80, 40, 20, 15, 11, and 10 meters with single-knob bandswitching. Designed for crystal or external VFO excitation. Incorporates key-click filter, line filter, copper plated chassis, pre-wound coils, 52-ohm coaxial output, panel meter, and high quality components throughout. Easy to build, even for the beginner. Employs 6AG7 oscillator and 6L6 final. Up to 30 watts power input.

$29.50 • **MODEL AT-1**
Shpg. Wt. 15 Lbs.

SPECIFICATIONS:

RF Amplifier Power Input	25-30 watts
Output Connection	52 ohms
Band Coverage	80, 40, 20, 15, 11, 10 Meters
Tube Complement:	
5U4G	Rectifier
6AG7	Oscillator—Multiplier
6L6	Amplifier—Doubler

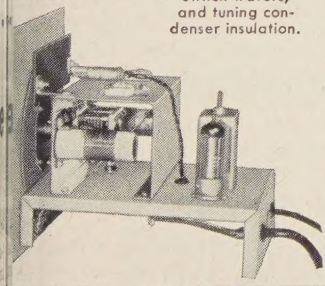
OA2 voltage regulator tube for stability.

Covers 160-80-40-20-15-11-10 meters.

Smooth-acting, illuminated and pre-calibrated dial.

6AU6 electron-coupled Clapp oscillator.

Copper plated chassis—aluminum case—profuse shielding—ceramic coil forms, switch wafers, and tuning condenser insulation.



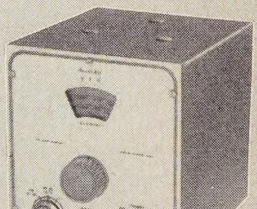
HEATHKIT vfo KIT

The Model VF-1 features illuminated and pre-calibrated dial scale. Cable and plug provided to fit the crystal socket of any modern transmitter. Covers 160-80-40-20-15-11 and 10 meters with 3 basic oscillator frequencies. Better than 10 volt average RF output on fundamentals. Derives operating power from transmitter power supply. Has VR tube for stability. Go VFO for more operating enjoyment.

MODEL VF-1

$19.50

Shpg. Wt. 7 Lbs.



SPECIFICATIONS:

Output Frequencies—1750-2000 kc, 7000-7425 kc, 6740-6808 kc. **Calibrated Bands**—160-80-40-20-15-11-10 meters. **Tube Compliment**—6AU6 Oscillator OA2 Voltage Regulator. **Power Requirements**—250-350 VDC @ 15-20 ma. and 6.3 VAC @ .45 A.

ORDER DIRECT FROM THIS AD . . . OR WRITE FOR FREE CATALOG. Describes more than 65 interesting "build-it-yourself" projects. Amateur equipment, hi fi amplifiers, and the complete Heathkit line of test instruments. Get yours today!

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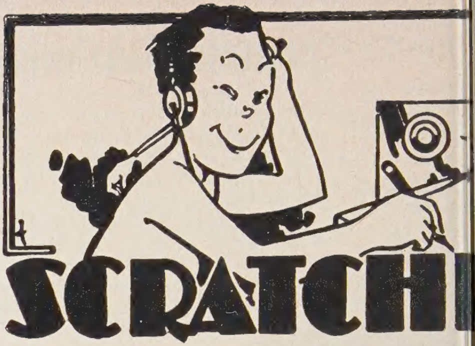


Feenix, A

Deer Hon Ed:

Well, here are your grate old geenyus inventor riting you again. Yes indeedy, lov old Scratchi, coming to you by curtasy H Uncle Sam's males. Hashafisti Scratchi, ch peen of the down-trodden amchoor, hero the masses—Hon. Ed., are I detecking a sn er from you? Can it be that you are bulleeving?

Scratchi are feeling reel chipper, so I p ing to you. Remembering in October, 1 when Five-Meter Bootlegger Club are ta me to big western rodeo, and trying to fo old Scratchi by entering him in bronco-bus contest? That are when Scratchi are win third place by riding Old Slicky Black Li ning. Of course, it are true that are catc my chaps and spurs in the stirrups so c getting off horse even if wanting to, but not taking away from Scratchi being hero.

Or how abouts in July, 1950, when are ting trapped in dentists office, and making slicky transmitter out of diathermy machin even using operating table as rotery be Peeples heering Scratchi's QRR and com to rescue me. Even getting big rite-up in l newspapers.

Remembering Mumbo-Jumbo, the wi doctor feller what living in south of N Borneo? Contacting him in September, 1 and he making fancy noises over air and ing rain rityoual, and next thing you kn ing Feenix are having 1/c rainstorm so h the cows needing snorkle toobs. Even H Guvner of state trying to getting Scratchi having Mumbo Jumbo giving rain to h state. This are most embarassing, on a Scratchi not keeping log, and not recall Mumbo Jumbo's call letters. So here Scra only parshul hero, on acct. only Feenix gett big rain.

And how about in November, 1953, scoffer feller? That are when Scratchi re being big-times hero. Are teeching see-w young gentelfellows going to skule at d ranch, and are heering sum signals on amch band what coming from left feeld. To mak

[*Continued on page 8*]

SCRATCHI

[*from page 6*]

long story short one, Scratchi are catching s of smuggling ring. Getting bundle of bux f reward monies. Of certain you recalling th Hon. Ed? How many spies you been catchi resently? Ha!

Of coursely, if you reeding letters I sendi you in past few yeers you knowing that Scratc are gratest inventor since Macaroni, and I c proving that to, so taking that smile off yo Hon. Face and listening.

How abouts invenshun what doing aw with TVI? I riting you abouts it in April, 194 All each ham are needing is small rig wh transmitting TV signal on all channels. Usi monoscope which are transmitting this me sage: Dew to Tecknickel Difficulties the Pa tern May Be Disturbed From Time to Tin During the Next Hour. Hon. Ed., you ca beeting that. When amchoor wanting to go air, he turning on TV rig and putting that sign on all nayberhood TV reseevers for few mi utes on each channel, then he going on a Even if having TVI, all naybors thinking T stayshuns having tecknickle trubbles. Were that a reel slicky?

In June, 1950, Scratchi even telling You Govvimints how to delivering A-bomb Scratchi are discovering how to attracking bu with small radio transmitter. So all having do is feed bugs small peece of U-299, or wha ever they calling that yuranium stuff, then a planes are dropping small radio transmitt over enemy lines. Transmitter attracking bug When enuf bugs, each with small peece yuranium in them, getting to transmitter, hc place going up in smoke. Are prolly getti medal for that idea, only no ones being ab to figgure how to feeding yuraniums to t bugs.

If you not being so skotch with your monie and sending me many bux in April, 1952, we both be rolling in doe. That are when Scratc desineing all-band transmitter with no plug coils and no band-change switch. Just usi one 160 meters crisstal and having outputs c all bands. Of course, it are reel fooler. Hee he Hon. Ed., it are only small rig what having many harmonicks it radiating on all bands!

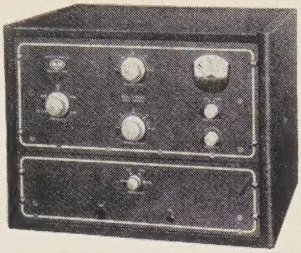
And what about the speshul sodder that n melting, or the famous Scratchi SPLAT siste (March 1953 I riting you on that), or tl matching networks what matching anything anything—or are I boring you with details?

I knowing you not being able to saying th Scratchi are not 1/c grate antenna expert. March 1948 telling everybuddys how to usi raleroad tracks for antenna. In May, 19 wanting everybuddys to riting congrassman having white lines down middle of roads mad of conducting paints so can using as mobi antennas. Hon. Ed., you sertainly rememberin Hon. Big Idea, the HFS antenna, which wor

[*Continued on page 98*]

NEW

table-top kilowatt amplifier



The B&W Model L-1000-A is a carefully engineered Grounded Grid Linear Amplifier with a power packing punch which will stand out in signal eloquence whenever the going gets rough. The clean design eliminates unnecessary circuits, yet all essentials have been included to give you long, dependable performance.

Just consider these features: 1,000 watts input SSB, 875 watts CW . . . completely self-contained including power supply! . . . bandswitching on all amateur bands 80 to 10 meters inclusive . . . pi-network final . . . broadbanded input—requires no tuning . . . all operating controls on front panel . . . controllable bias supply . . . completely shielded for TV1 suppression . . . requires only 80 watts r.f. exication . . . ideal for use with any transmitter nominally rated at 100 watts such as B&W 5100 Series, Collins 32V Series, Johnson Viking I & II, etc.

ODEL 5100-B A SUPERLATIVE AM-CW TRANSMITTER

• high level push-to-talk AM telephony . . . 140 watts input • clean CW keying – break-in on all bands . . . 180 watts input • sparkling SSB . . . 180 watts input . . . when combined with the 51SB-B single sideband generator • bandswitched throughout • integral VFO or crystal frequency control • coverage of 80 through 10 meter amateur bands • ideally suited to drive L-1000-A Linear Amplifier.

Net Price.....$475.00

ODEL 51SB-B GENERATOR FOR SUPERLATIVE SSB

• fully bandswitched
• voice operated control • push-to-talk • speaker deactivating circuit
• powered by 5100-B transmitter
• no wiring required
• TV1 suppression • unitized construction.

Net Price.....$265.00

ODEL 370 ADAPTER FOR RECEPTION YOU NEVER DREAMED POSSIBLE

• truly outstanding SSB reception, select upper or lower sideband at the flip of a switch
• true single signal CW operation suppresses unwanted heterodynes by 50db
• selects either sideband of an AM signal
• may be combined with any communications receiver
• normal operation of your receiver is not disturbed in any way.

Net Price.....$131.50

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Prices subject to change without notice.

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BARKER & WILLIAMSON, INC.
237 Fairfield Avenue, Upper Darby, Pa.

. . . de W2NSD

NEVER SAY DIE

The Underground

I see where some Aussies have been delving around in caves using low power two meter transceivers for communication to the surface and from cave to cave. The results achieved were beyond all expectations with good solid signals being heard from flea power rigs through hundreds of feet of ground. It seems to me that W6LLP, W6CLW, and other ham spielunkers should get hot with this and see what really can be done. The last I heard it was supposed to be impractical to shoot radio waves through terra firma. If this has been repealed there should be a few million dollars waiting for the practical applications of it with regards to radar hunting for oil, minerals and lemurites. Somebody get out my chain ladder and Gonset.

Publicity

One of the things our poor old hobby needs more than anything else is some advertising. We would be in a lot better position if more people had some inkling of what ham radio is and what sort of service it performs. In line with this need *CQ* will undertake to help in any way it can to get news of our hobby into newspapers, on the radio, etc. In order to do this we must first have your help. The general story of ham radio is interesting, but it is important to have a specific incident or anecdote to get the story started. The recent hubub over the increased activity of the Russian stations is a good example of this. Every now and then something of good general interest takes place . . . the next time you hear of such an event send it in to *CQ* on the double.

When ham radio saves a life, participates in a disaster, or is connected with anything of real news value let us know right away.

Other information will be of value too . . . such as incidents where families keep in communication over long distances regularly, where someone meets over the air and eventually gets married, and things of that nature. Let us know of all the famous hams you can think of, along with their call letters. Anybody in the public eye. There must be at least one Congressman with a ticket. Maybe several mayors, actors, etc. Lots of etc. How about well known writers? Cartoonists? Like Bandel Linn, W4HXL, who executed (?) the cover this month. How about desperados? Have we any of the be class crooks in our ranks? Does anybody kn Anastasia's call?

Jim and I

Are tired of taking all the blame for err in captions in *CQ* and we think you sho know that a third unsteady hand has b added to the creaking oars. Back in the Ma *CQ*, page 112, I outlined the qualifications advanced obscurity on the *CQ* payroll. Sho thereafter a modest telegram came sayi "YOU COULD ONLY HAVE BEEN TAL ING ABOUT ME IN YOUR EDITORI EXCEPT YOU UNDERESTIMATE ME S This retiring lad got the job. He packed two meter kilowatt, his Model 26, and a h trailer full of other gear and moved from S Lake City to NYC to become W7NVY/2. T next time you find a mistake in *CQ* compl to Art Brothers.

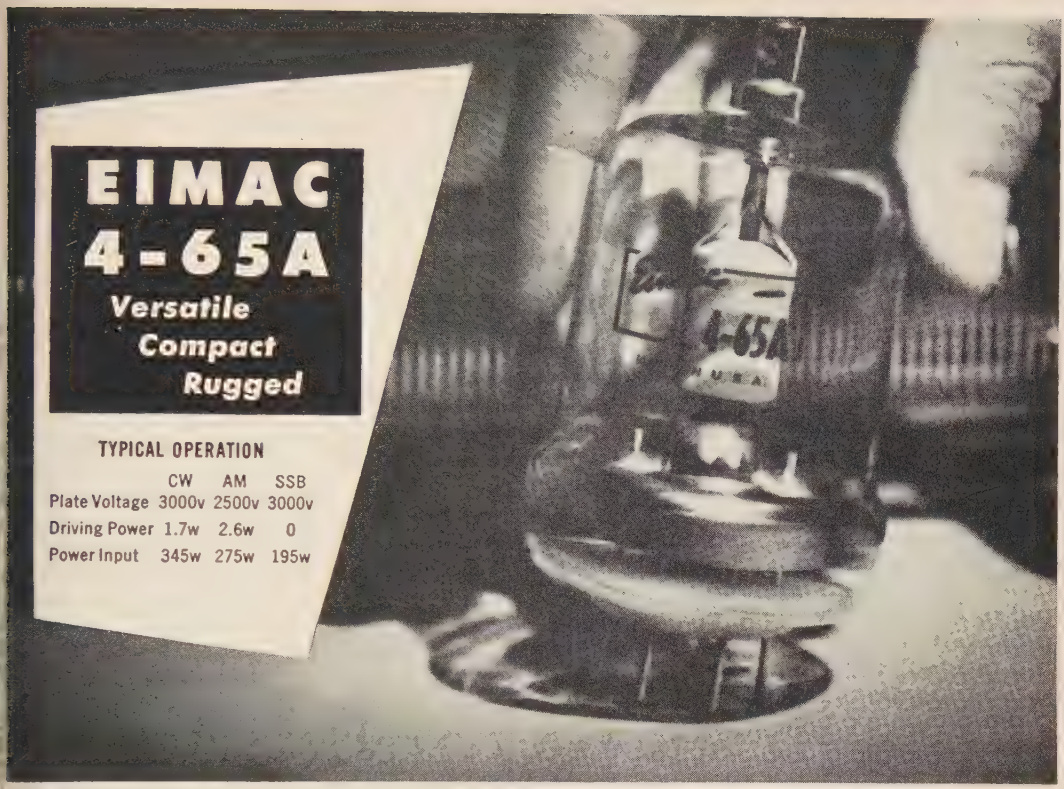
Battery Eliminator

The more test equipment I get the smoot things seem to run. The latest addition wa Heath Battery Eliminator. Now I wonder h I ever got along without it! Every now a then I had to lug out a spare car battery checking something, now all I do is hook the Heath. Within the first two weeks in shack it was put to use in bringing the car b tery to top charge, recharging an old sp that had been kicking around, adjusting a r ulator, checking out some six and twelve v relays, checking the Gonset G-66 receiv testing and aligning my old car receiver, te ing a marine transmitter-receiver, and so minor jobs. Since the Eliminator has an a meter as well as a voltmeter I was able to fi out exactly how much current the various ga gets on the car draw as well as the mob equipment. Hardly a day goes by that I do yank it off the shelf for something.

Flexible Meters

I get a special kick out of putting the formation in one of our articles to use myse In this case it was WINPL's article in the M issue which made it easy to use five identic 0-500 voltmeters for my 500 watt two me final. I left two intact to measure the grid a screen voltages. The other three were modifi

[*Continued on page 12*]



For low to medium powers, mobile or fixed station, the Eimac 4-65A is truly one of the most versatile tubes in amateur use today. The least expensive and smallest of the Eimac internal-anode tetrodes, this compact, rugged tube is ideal for all-band CW, AM, and SSB rigs.

Short, heavy leads and low interelectrode capacitances contribute to stable, efficient operation of the 4-65A at high frequencies. The tube operates over a wide range of plate voltages — 600 to 3000 volts with power inputs from 90 to 345 watts — and as with all Eimac tetrodes, it requires low driving power and simplifies transmitter construction.

For mobile use, the radiation-cooled 4-65A is a natural. Its instant heating filament eliminates battery drain during stand-by periods. And through application of filament and plate power simultaneously, no warm-up periods are required.

For further information on the 4-65A, write the Eimac Amateur Service Bureau or visit your Eimac distributor.

Eimac

EITEL-McCULLOUGH, INC.

SAN BRUNO, CALIFORNIA

The World's Largest Manufacturer of Transmitting Tubes

EDITORIAL

[*from page 10*]

to read the grid, screen, and plate currents. No difficulties were encountered, though the construction of my Model 301 meters was somewhat different from that described in the article.

16½" of Twin Lead

Once the half gallon was on the air I found that most of the neighborhood TV sets just about collapsed. My best DX was a poor distraught woman two blocks away who was getting me on radio, TV and Hi-Fi. This nasty turn of events might discourage some, it did me. Even my TV practically jumped off the table when I crunched on the powerhouse. Just for kicks I tried the first-aid measure: 16½" length of twin lead hung from the TV set antenna terminal with the other end open and hanging down. Presto: no more TVI. I then went on the air day and night for three days telling all and sundry to pick up their filters for free at my house. Quite a few called for them and not one has ever come back or called again. I rechecked with a few of the worst cases and they reported that they no longer could hear me.

For your edification, the 500 watts works out wonderfully. I have worked all sorts of DX I never could have hooked with my low powe When I push that button everyone hears m Now I have to get busy and knock togeth one of those low noise preamplifiers so I ca hear who is calling me.

W2NSD Travels Again

Next month I'll be able to tell you a b about the West Gulf Convention in Galvesto which came about in the middle of June. A this is written my trip down there is still tw weeks off and I am anticipating it. After th Convention I expect to spend a couple da visiting W5YVJ on his ranch in Houston. A a rabid hoss lover I can hardly wait to g there.

In July I'll be out to the National Conve tion in San Francisco. I haven't been there f ten years . . . it'll be fun to get around and s the town again. From there I'll go down L.A. for a few days and then back to stean ing old NYC again to put the finishing touch on our special September issue. I'm open invitations to skin dive, water ski, or horsebac ride out there.

Scratchi Centennial

One hundred episodes of Scratchi! No matt what cigarette you smoke Scratchi is far an away the most popular feature in *CQ*. A no

[*Continued on page 112*]

HOW MUCH SHOULD YOU PAY FOR A GOOD ROTARY BEAM?

The only true measure of value is (a) performance and (b) amount of aluminum per dollar cost. Study these specifications—compare them—and you too will agree, along with thousands of hams, that GOTHAM beams are best!

TYPE OF BEAM. All Gotham beams are of the full half-wave plumber's delight type; i.e., all metal and grounded at the center. No wood, tuning stubs, baluns, coils, or any other devices are used.

GAIN. Gotham beams give the maximum gain obtainable. Our 2-element beams give a power gain of four (equivalent to 6 db.); our 3-element beams give a power gain of seven (8.1 db.); and our 4-element beams give a power gain of nine (9.6 db.)

FRONT-TO-BACK RATIO. We guarantee a minimum F/B Ratio of 19 db. for any of our 2-element beams; 29 db. for any of our 3-element beams; 35 db. for 4-element beams.

MATCHING. Matching of the transmission line to the beam is extremely simple and quick. Everything is furnished and the matching is automatic. No electronic equipment or measuring devices are required.

ASSEMBLY AND INSTALLATION. No special tools are required for assembly and installation. Entire job can be done by one man in less than an hour. Full instructions are included with each beam.

MAST. Any Gotham beam can be mounted on a simple pipe mast. Diameter of the pipe should be between ¾" and 1⅝".

STANDING WAVE RATIO. A very low SWR of approximately 1.5 to 1 will result from following the instruction sheet, depending on the height above ground and the surrounding area. If an SWR indicator is available, Gotham beams can be quickly and easily adjusted to 1.1.

STANDARD AND DELUXE BEAMS. Standard beams in the 6, 10 and 15 meter bands use ⅝" and ¾" tubing elements; the deluxe models for these bands use ⅞" and 1". In 20 meter beams, the standard has a single boom, while the deluxe uses twin booms.

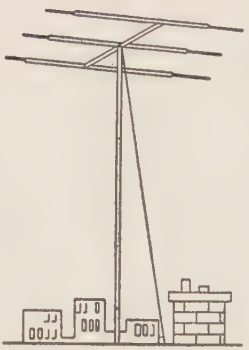
WHAT WILL A GOTHAM BEAM DO? A Gotham beam will amplify the transmitted and received signal tremendously and will greatly reduce noise and QRM.

NEW VERTICAL ANTENNAS

ENGINEERED VERTICAL ANTENNAS for 40 meters, 80 meters, 160 meters. Gotham proudly announces three vertical antennas for unsurpassed performance on 40 meters, 80 meters, and 160 meters. Each antenna is absolutely complete, canb e assembled in less than two minutes and requires no special tools or electronic instruments for adjustmen and operation. Radiation is omni-directional, with maximum radiation at the very low angles necessary for DX operation. These three vertical antennas have been developed over a period of three years in respons to requests by hams for efficient, fool-proof, small-space, low-cost antennas for 40, 80, and 160 meters. Two 12 foot lengths of tubing and loading coil in each vertical antenna. Literature available.

# V40	vertical for 40 meters	$14.95
# V80	vertical for 80 meters	$16.95
#V160	vertical for 160 meters	$18.95

HOW TO ORDER: Send coupon with check or money order directly to GOTHAM or visit your local distributor. Immediate shipment by Railway Express, charges collect. Foreign orders accepted. Some leading distributors who handle GOTHAM beams: Offenbach & Reimus, Curie, M. N. Duffy, Alltronic, Purchase Radio, Lew Bonn Co., Henry Radio, Evans, Gib's Ham Gear, Hobe's Radio, Western Electronics, Harris Radio, Capitol Radio, Kinkade, Johannsen, W. H. Edwards Co., World Radio Labs, Graham Electronics, Geo. D. Barbey Co., Hudson Radio, Selectronic, Radio Electric Service, Ken-El's Radio, NRM Wholesale Radio.



This Full Size Gotham Cost Only $21.95 And Brought In 87 Foreign Countries, All Continents And 30 Zones On 35 Watts!

MAIL THIS COUPON TODAY!
10-DAY MONEY BACK GUARANTEE

GOTHAM

107 E. 126th ST., NEW YORK 35, N. Y.

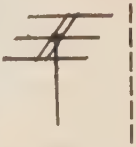
Enclosed find check or money-order for:

2 METER BEAMS			
☐ Deluxe 6-Element	$9.95	☐ 12-El	$16.95
6 METER BEAMS			
☐ Std. 3-El Gamma match	12.95	☐ T match	14.95
☐ Deluxe 3-El Gamma match	21.95	☐ T match	24.95
☐ Std. 4-El Gamma match	16.95	☐ T match	19.95
☐ Deluxe 4-El Gamma match	25.95	☐ T match	28.95
10 METER BEAMS			
☐ Std. 2-El Gamma match	11.95	☐ T match	14.95
☐ Deluxe 2-El Gamma match	18.95	☐ T match	21.95
☐ Std. 3-El Gamma match	16.95	☐ T match	18.95
☐ Deluxe 3-El Gamma match	22.95	☐ T match	25.95
☐ Std. 4-El Gamma match	21.95	☐ T match	24.95
☐ Deluxe 4-El Gamma match	27.95	☐ T match	30.95
15 METER BEAMS			
☐ Std. 2-El Gamma match	19.95	☐ T match	22.95
☐ Deluxe 2-El Gamma match	29.95	☐ T match	32.95
☐ Std. 3-El Gamma match	26.95	☐ T match	29.95
☐ Deluxe 3-El Gamma match	36.95	☐ T match	39.95
20 METER BEAMS			
☐ Std. 2-El Gamma match	21.95	☐ T match	24.95
☐ Deluxe 2-El Gamma match	31.95	☐ T match	34.95
☐ Std. 3-El Gamma match	34.95	☐ T match	37.95
☐ Deluxe 3-El Gamma match	46.95	☐ T match	49.95

(Note: Gamma-match beams use 52 or 72 ohm coax. T-match beams use 300 ohm line.)

NEW! RUGGEDIZED HI-GAIN 6, 10, 15 METER BEAMS

Each has a TWIN boom, extra heavy beam mount castings, extra hardware and everything needed. Guaranteed high gain, simple installation and all-weather resistant. For 52, 72 or 300 ohm transmission line. Specify which transmission line you will use.



☐ Beam #R6 (6 Meters, 4-El)..... $38.95
☐ Beam #R10 (10 Meters, 4-El).... 40.95
☐ Beam #R15 (15 Meters, 3-El)..... 49.95

Name .....
Address .....
City ..... Zone..... State.....

Letters . . . to the editor

Dear Sir:

We are writing you at the request of Mr. Willard Guimont, W6YMD.

Some months ago your magazine carried a letter to t editor concerning the lawsuit filed by the Pacific Pa sades Civic League, Inc. and other persons agair W6YMD to permanently enjoin him from erecting telephone pole support for his rotary beam antenr The amateurs of the Nation generously came to his a sistance and the matter has been in and out of court f almost a year.

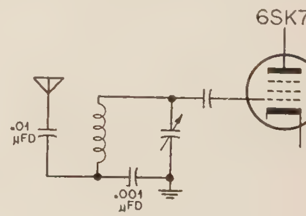
We are now pleased to announce that the case h been settled. The provisions of the settlement perm W6MYD to erect his antenna system and pledge the c operation of the residents of the area to the eliminati of TVI and BCI. We feel that this settlement, while entails some restrictions as to future antennae, is major victory for the right of amateurs to use their ov property as they see fit in the pursuit of their hobb Inasmuch as the case did not go to the Appellate Cou there will be no legal precedent established. It is o belief that every additional antenna system permitted stand strengthens the case of every amateur who mee opposition in the future.

Howard F. Sheperd, Jr., W6QJ
Attorney At Law
1124 Rowan Building
Los Angeles 13, Calif.

Dear Wayne:

The following method of coupling coaxial lines into command receiver has resulted in an increase of sen tivity of from 3-5 db on a 3-6 ms BC-454 used on original frequency. When used as a tunable i.f. for crystal controlled 2 meter converter the gain is abo 6 db.

Most articles on conversion of command equipme merely suggest the substitution of a coaxial connect for the original antenna binding post, but a tremendo loss of sensitivity was noted when using low impedan feed lines.



The series condenser from the antenna post should l removed and a .01 µfd connected from the antenna i put to the terminal on the antenna coil socket that grounded to the condenser frame. At the same time r move the solid tinned ground wire and put a .001 µf disc ceramic in series with the coil to ground.

The changes are shown above. Components whose par values are not shown are original parts and are show for the sake of clarity.

Total time for these modifications comes to abo thirty minutes.

The dividend in results is tremendous. This scheme ha been tried in a BC-946 which is used as an i.f. for Tri-Band with results similar to those obtained with tl BC-454.

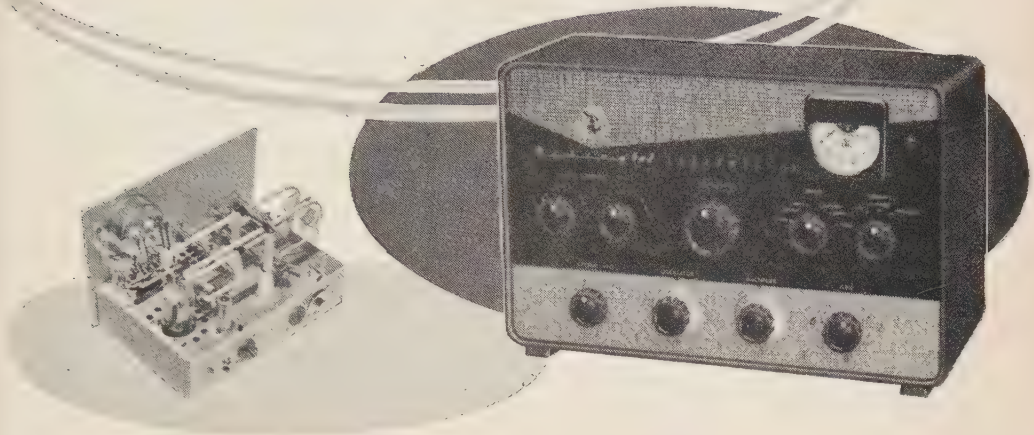
The same can also be done with any receiver. It is convenient means of coupling without the bother winding and pruning primary coils. More ambitio workers can experiment with the value of the litt panel mounted "align input" condenser which may resu in still further improvement.

Dan Rosenbaum, W2JC

[*Continued on page 18*]

NEW for VHF!

the Viking "6N2"



150 watts CW input . . . 100 watts AM phone!

This compact new VHF transmitter offers instant band-switching coverage of both 6 and 2 meters. Completely shielded and TVI suppressed, the "6N2" may be used with the Viking "Ranger," Viking I, Viking II, or similar power supply-modulator combinations capable of at least 6.3 VAC at 3.5 amp., 300 VDC at 70 ma., 300 to 750 VDC at 200 ma. and 30 or more watts of audio. Power input is rated at 150 watts CW and 100 watts AM phone . . . cathode keying results in excellent waveform.

The Viking "6N2" may be operated by external VFO or built-in crystal control. 8 to 9 mc. crystals are used in a pentode oscillator, which doubles in the plate circuit. This avoids tricky overtone circuits, eliminates critical adjustment and prevents frequency output which is not harmonically related to the fundamental of the crystal. VFO operation may be obtained by simply plugging in an external VFO with an 8-9 mc output and turning the VFO/Crystal switch to the VFO position. Provision for zeroing the VFO is also provided.

The final amplifier uses a type 5894 dual tetrode in a push-pull circuit . . . final tank is a dual band device and requires no switching when changing bands. High efficiency is obtained by the use of silver plated balanced tank circuits with parallel lines for maximum efficiency on 2 meters.

TUBE LINE-UP

6U8 (Pentode Section) — Crystal — Oscillator — Doubler
6U8 (Triode Section) — Tripler
6360 Tripler-Driver
5894 Final Amplifier
6AQ5 Clamper

The Viking "6N2" is available completely wired and tested or as an easy-to-assemble kit. All tuning controls are located on the front panel . . . all circuits are metered for easy tune-up. Cabinet is finished in attractive maroon and grey with green nomenclature. Complete kit includes assembly instructions, photographs, diagrams, and step-by-step wiring directions. Wiring, all necessary hardware furnished — no drilling or metal work necessary. Dimensions: 13⅛" x 8⅜" x 8½". Shipping Weight: 14 pounds.

Cat. No. 240-201. Viking "6N2" Kit with tubes, less crystals, key and microphone. **$99.50** Amateur Net

Cat. No. 240-202-2. Viking "6N2" wired and tested with tubes, less crystals, key and microphone. **$129.50** Amateur Net

NOTE: Scheduled for August delivery — price subject to revision at time of delivery.

E. F. Johnson Company
2932 SECOND AVENUE SOUTHWEST • WASECA, MINNESOTA

Capacitors • Inductors • Knobs • Dials • Sockets • Insulators • Plugs • Jacks • Pilot Lights

Engineers Wanted
For unusual engineering and technical employment opportunities . . . write to our engineering department.

LETTERS *[from page 14]*

Dear Wayne:

The transistor article in May *CQ* was interesting stu—but I hate to see remarks such as, "experimenting wi making transistors is something few hams are going be able to do." This doesn't jibe with an account in tl Short Wave Magazine for February 1954, in whi transistor-making experiments by G3HMO were describe Best DX was reported as some 35 miles with the first e perimental models; and I believe there were follow-u articles in this fine British magazine. Let's not tal such an extremely negative attitude from the star after all, amateur radio operators are known for doir those things that "can't be done!"

How about an article on making your own transisto at home. . . . I understand some American hams ha done so with germanium taken from the 1N34A cryst diode.

Neil A. Johnson, W2OL
10 North 10 Ave.
Mount Vernon, N. Y.

Dear Sir:

As you may know, increasingly, 2 and 6-meter Gons Communicator type equipment is being used for loc communications links for several reasons including po tability, lack of QRM, difficulty of enemy jamming i this frequency region, etc.

There is an **increasing** interest in FCC policy regar ing non-attended relay transmitters operated in th amateur bands, and the possibility of using the ine pensive Gonset Communicators on fixed CD frequenci adjacent to the amateur bands. To my knowledge the matters have not been covered by either *QST* or *CQ*

I wonder if you could cover these matters in one c a series of articles on the Amateur and CD in *CQ*?

Roger H. Decker, K6JF
2809 Garden Ave.
Concord, Calif.

Ed: There is?

Phone Patch

Dear Wayne:

You really started something when you printed a pa of my letter on phone patches (Page 51 of the Feb issue).

The letters, asking for more information, starte coming in just as I was leaving for Tokyo. I no have over two hundred to answer. Received two letter from home yesterday and there are still more coming ir

How about putting two short notices in CQ tellin all them Hams that I have too many to answer ind vidually but I will draw up the circuit, make up tw lists of parts suppliers and give other pertinent data i an article in the near future?

Am now on Okinawa doing some telephone engineer ing work. My own telephone system is being set up fo dial conversion. (Incidently, we don't operate in Clay ton, just live there and have an office there).

Richard R. Mann
Western States Telephone Co

FCC Public Notice

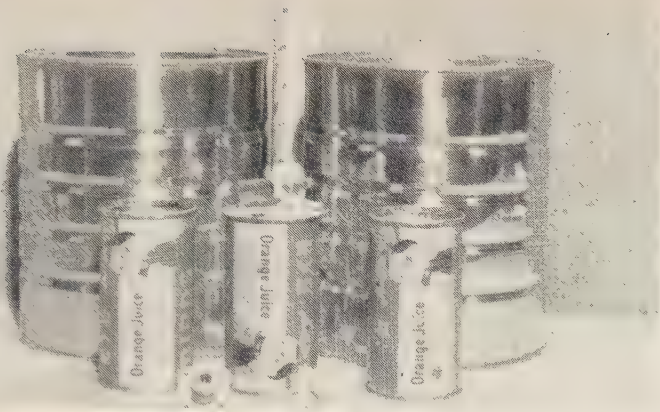
On the 20th of July, 1956, the FCC has or dered all Standard (AM), FM and TV broad cast stations in the United States to go of the air for purposes of conducting a CONEL RAD drill.

This drill will begin at the following times in your respective time zones:

3:10 PM EST
4:10 PM EDST
2:10 PM CST
3:10 PM CDST
1:10 PM MST
2:10 PM MDST
12:10 PM PST
1:10 PM PDST

The drill will be in operation for 15 minutes only and only stations authorized to operate on 640 or 1240 kc will be on the air at that time.

[Continued on page 108]



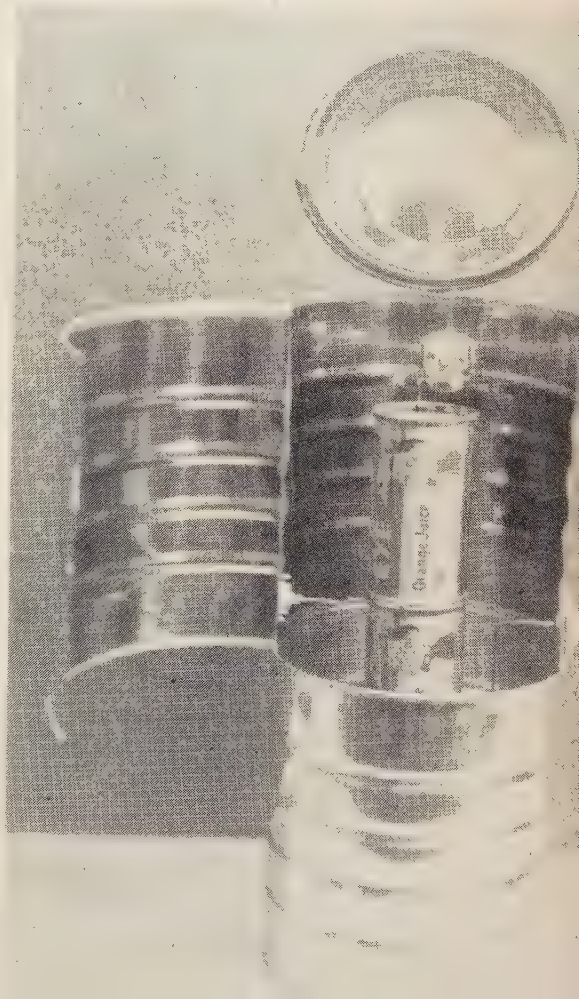
Materials needed for filter

a real can-do project for Six . . .

Six Meter TVI Filter

Robert B. Kuehn, WØHKF
641 S. Saratoga St., St. Paul, Minn.

below: the completed filter



When the extremely simple but effective cavity TVI filter for 2 Meters appeared in *CQ*[1] no time was lost in duplicating it with gratifying results. Later, becoming interested in 6-meter operation, the thought naturally arose, 'why not a cavity type filter for 6 Meters too?'

The re-entrant resonator is in effect a shortened quarter-wave length of coax line placed in series with the antenna and tuned to resonance by a loading capacitor connected from the inner conductor to the outer shell. Thus tuned it is very sharply resonant and passes energy only at its fundamental frequency, all other harmonics and spurious radiations being shorted to ground.

With all due respect for K2CWO's equations and Bird Termaline wattmeter (neither one of which have I the slightest acquaintance with) I gathered together a selection of tin cans and set to work with a 12-inch schoolboy ruler. Of necessity ignoring the caution that "We work with the outside diameter of the inner conductor and the inside diameter of the outer conductor," two varieties were picked out that seemed to approach the optimum ratio for coax line. The large cans, two of which are needed for the 6-meter filter, measure 6 inches in diameter by 7 inches tall. The three frozen fruit juice containers, which comprise the inner conductor, are 2 inches in diameter by 3¾ inches long. Both sizes are commonly used for foods of all kinds and are universally available. The shiny cans shown in the photographs were not ordered special from the manufacturer' but picked out of a dump, washed and rubbed with

[1]Robert Schlesinger, K2CWO "Cavity TVI Filter," July 1954, *CQ*, page 14.

[*Continued on page 94*]


ANT
XMTR

Hiding A Transmitter

R. B. Schnick, W3VAG
Riderwood, Md.

"Calling all contestants in the Maryland Mobile Radio Club hidden transmitter hunt, this is W3VAG portable three," shouted this fellow seated at a picnic table. Surely those picnickers not familiar with ham activities who passed by this table were tempted to call the little men in white coats to fetch this fellow hollering to no one in particular. They wouldn't understand that with an F-1 button hidden under your shirt you had to shout in order to

move those carbon granules. Nor would they have known that the line (hook-up wire) on that fishing rod was loaded with a couple of watts RF.

As a matter of fact, those funny people running around with earphones on their heads and gadgets in their hands who kept stretching their necks looking up into trees, didn't know the fishing rod was hot either. Ron, W3VLL, and I planned to put on a definitely different hunt this time and we did it. Here was proof positive. The boys had been in the area an hour and some walked within ten feet of the hidden transmitter and still they suspected nothing. The little transmitter (version of the "28-9" CQ, May, 1953), powered by the quiet running PE-101 dynamotor and its battery, were cuddled down there in the box by the picnic table. The coax to the fishing-rod antenna and its radials were buried under the grass. The control cable and mike cable also ran under ground and then up inside the clothing of the operator. Best of all, the operator (W3YPM) and his helpers, were all complete strangers to those hunting for the transmitter.

Finally, W3QLF, with undying faith in his snooper, built up enough courage to ask these strangers if he might look inside the box there by their table—that was it, all over. W3TFR and W3LMC followed suit. The boys really earned their trophies and we wished we had one for everybody who participated. Almost two and one half hours to find a transmitter hidden four miles from the starting point and most of the hunting was done on foot. ■

This innocent looking group of picnickers include Hal, W3YPM, the smallest harmonic of W3VAG, and Dick Prather, W3BOM.

William I. Orr, W6S
Editor, Radio Handbook

an Unusual SSB Modulator

The balanced modulator is the heart of most single sideband transmitters. It is generally operated at relatively low radio frequencies, and may be used to modulate or "beat" voice frequencies against a carrier wave to produce double sidebands minus the carrier frequency. It may also be employed at higher radio frequencies to allow frequency conversion of the single sideband (SSB) signal, while providing substantial rejection of the mixing signal from the local oscillator.

The balanced modulator may be thought of as an electronic switch wherein the carrier frequency is switched on and off at the frequency of the modulating signal. Either vacuum tubes or metallic diodes may be used for such a switching circuit. A balanced modulator circuit employing two triode tubes is shown in *Figure 1*. The carrier frequency f(c) is applied to the grid circuit so that the impressed signal is in phase on both grids of the modulator, while the modulating frequency f(m) is applied to the grid circuit of the triodes so as to produce a phase reversal of the signal of 180° between the two grids.

When the signal in the plate circuit of t balanced modulator is examined, it will found that the carrier frequency f(c) is a sent. The pulses of plate current caused by t grid signal of f(c) cancel each other out, ma ing the net result zero in the output pla circuit. Thus any variation in grid signal vo age that is applied to both tube grids in para lel and in the same phase will cancel out in t push-pull plate circuit.

The modulating frequency f(m) is appli to the grids of the balanced modulator in push-pull manner. However, the modulati frequency is usually in the audio frequenc range, and the tuned plate tank circuit offe little load impedance to such low frequencie Thus, neither f(m) nor f(c) appear in the pla circuit of the balanced modulator. Howeve when both f(c) and f(m) are applied to t grid circuit of this stage, the plate circuit wi contain signals that are grouped either side c the carrier frequency. These frequencies ar equal to the carrier frequency plus and minu the modulating frequency, and may be terme a *double sideband suppressed carrier signa*

Fig. 9. Low frequency stages are at the left of the chassis. The 6BA6 is in the foreground, with the 6AR8 balance potentiometer behind it. To the rear are the 6AR8, the audio level control and the 12AX7 speech amplifier. To the right of the Mechanical Filter are the 80 meter mixer and oscillator stages. The conversion crystal is inside the small shield can. At the right are the cascode buffer and parallel 6AG7 stages, with the 80 meter tank coil in the foreground.

The balanced modulator is acting as a switch tube, switching the carrier f(c) on and off at the modulating frequency f(m).

If the resulting two sidebands are passed through a suitable filter, one of the sidebands may be passed and the other rejected. A *single sideband suppressed carrier signal* will then be observed at the output of the filter.

Diode Modulators

The double triode tube may be eliminated, and the circuitry rearranged to allow the use of four metallic diodes connected as a shunt-quad modulator, as shown in *Figure 2*. When balanced diodes and transformers are used, the carrier pulses across diodes X1-X2 are balanced out by the equivalent pulses of opposite polarity that appear across diodes X3-X4. The carrier frequency f(c) therefore does not develop in the output circuit. Application of a modulating voltage to the quad alternately cuts off one pair of diodes, then the other pair

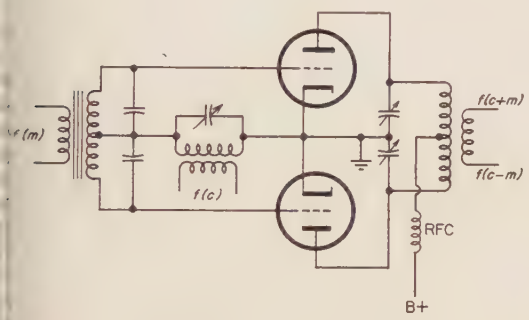


Fig. 1. Basic push-pull balanced Modulator. The output from a modulator (mixer) of this type consists of frequencies equal to the carrier frequency plus and minus the modulating frequency. Neither the carrier frequency or the modulating frequency appear in the output circuit.

as the polarity of the modulating signal reverses itself on each half-cycle. The shunt-quad may thus be thought of as a double-pole double-throw electronic switch, operating at the frequency of f(m).

For conditions of highest linearity, the diodes are to be preferred over the vacuum tube modulators. However, the cost of improvement in linearity is obtained only at circuit complexity. It is necessary for conditions of good linearity to have low impedance input and output circuits to such a quad. The varying load imposed by the quad upon the carrier frequency generator can often lead to instability of the oscillator, or perhaps to frequency modulation of the oscillator. Coupling of the carrier oscillator to such a low impedance quad is best done through some type of isolating stage, such as a cathode follower. This entails the use of an additional tube. In like

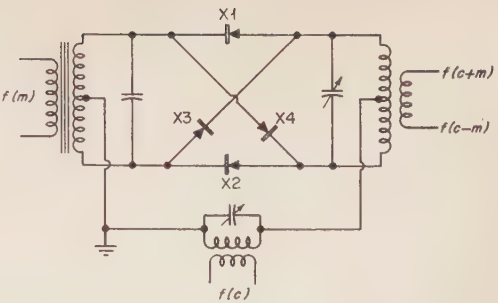


Fig. 2. The "ring" or shunt-quad Modulator. Employing four metallic diodes, this modulator is capable of low distortion performance if the input and output circuit impedances are held at a low level.

manner, it is necessary to provide a low impedance source for the modulating signal, f(m). The use of a cathode follower or an impedance matching transformer between the audio driver and the quad modulator is a necessity. If it would be possible to obtain the excellent linear operation of the diode modulator in a circuit of high input and output impedance, the design of a simple balanced modulator would be greatly simplified.

The 6AR8 Switch Tube

The thought that the balanced modulator operates as an electronic switch offers interesting and novel applications of one of the new tubes that has recently been released for color television purposes. Such a tube is the General Electric 6AR8 Sheet Beam tube, whose general characteristics are listed in *Figure 3*.

The 6AR8 is a minature double plate sheet-beam tube which incorporates a pair of balanced deflectors to direct the electron beam to either of the two plates, and a control grid to vary the intensity of the beam. The tube is designed to be used as a synchronous detector in color television receivers, and as an electronic switch in the burst gate circuit of such receivers. When the 6AR8 is employed as a synchronous detector, it is used as shown in *Figure 4*. The focussing electrodes of the tube form the electron stream into a sheet beam which is attracted to the plates of the 6AR8 tube by virtue of the positive potential applied thereto. Between the electron gun and the plates, the electron beam passes between two deflecting electrodes. Depending upon the voltages applied to the deflectors, the beam will be directed entirely to either one or the other of the two plates, or be proportioned between them. The frequency of the signal applied to the deflectors determines the rate at which the plate current is switched between the two plates. The magnitude of the plate current is determined by the negative voltage that is ap-

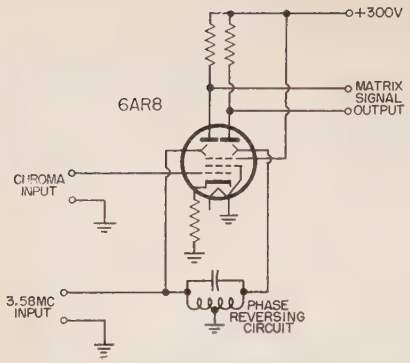


Fig. 4. The 6AR8 tube as employed for TV service as a synchronous detector.

plied to the #1 control grid. The 6AR8 tube may be considered as equivalent to a voltage controlled single pole double-throw switch through which a current, the magnitude of which is also voltage-controlled, flows. The transfer characteristics of this interesting tube are shown in *Figure 5*.

In color TV service, the deflecting electrodes are switched at a frequency of 3.58-Mc., the push-pull switching voltage being obtained from a balanced resonant circuit connected between the deflecting electrodes, as shown in *Figure 4*. The Chroma input is applied to the control grid of the 6AR8, and the resulting output signal for the Matrix is taken across the two plate load resistors of the tube.

The 6AR8 as a SSB Balanced Modulator

The 6AR8 may be divorced from its color TV applications and used as a balanced modulator for SSB work. The linearity of the transfer characteristic shown in *Figure 5* would indicate that the linearity of this tube when used in a suitable balanced modulator circuit would be excellent. A simplified circuit suitable for SSB work is shown in *Figure 6*. The r.f. carrier is applied to the control grid of the 6AR8, modulating the electron beam at the frequency of the applied signal. In the exciter to be described, this frequency is 455 k.c. The electron stream then passes through the deflection plates towards the collecting plates. A push-pull audio signal is applied to the deflection electrodes, switching the electron beam back and forth between the two collector plates at an audio frequency rate. The exciting r.f. signal is applied in "single-ended" fashion to the 6AR8 circuit, and is balanced out in the push-pull plate circuit configuration. To obtain maximum conditions of balance, the plate potential of the 6AR8 is applied through the arm of a potentiometer, the ends of which are attached to the two plates of the tube. By adjusting this control for maximum rejection at the carrier frequency, more than 40 db. of plate circuit carrier rejection may be obtained.

The main advantage of the 6AR8 wh
used as a balanced modulator is that it wo
well when the input and output circuits are
relatively high impedance. One-half of
12AX7 may be employed as an audio pha
inverter to supply push-pull audio signals
the deflection plates. Usual values of plate a
cathode load resistors may be employed in t
phase inverter circuit, without fear of exc
sive circuit loading by the balanced modula
stage. It is not necessary to use a low-mu t
ode with the accompanying low values of pla
and cathode load resistance, such as is nec
sary when driving a metallic diode modulat

In addition, there is very little reaction b
tween the mixing oscillator and the balanc
modulator. Many balanced modulators impo
a non-linear load upon the mixing oscillato
If this oscillator is a variable frequency devic
frequency modulation will occur during t
mixing process. This action produces a peculi
low frequency "growl" on the SSB sign
which is most annoying, and difficult to cur
This effect is entirely absent when the mixi
oscillator is coupled to the 6AR8 modulato
The high impedance circuits of this stage allo
the use of simple input circuits, and also allo
the use of the Collins Mechanical Filter
separate the wanted and unwanted sideband

Simple precautions must be taken to preve
the 455 k.c. energy from being coupled in
the audio system, and into the rest of the SS
equipment. Each deflection plate of the 6AR
is bypassed to ground with a 100 uufd. mi
condenser, and 10,000 ohm series isolating r
sistors are placed between the 12AX7 pha
inverter and the balanced modulator. Th

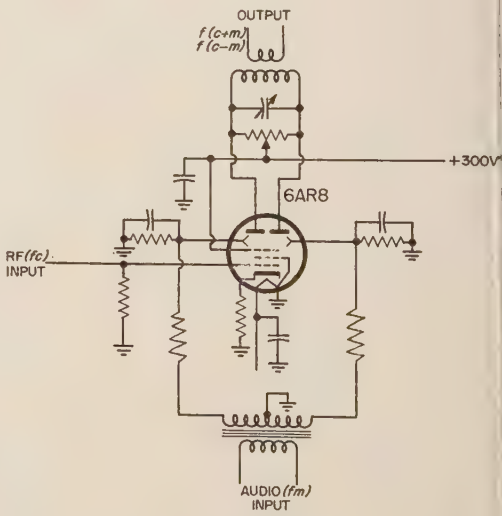


Fig. 6. The 6AR8 used as a balanced Modulator R.F. input is applied to the control grid, and push-pull audio to the deflection plates. The output circuit contains a double-sideband suppressed carrier signal.

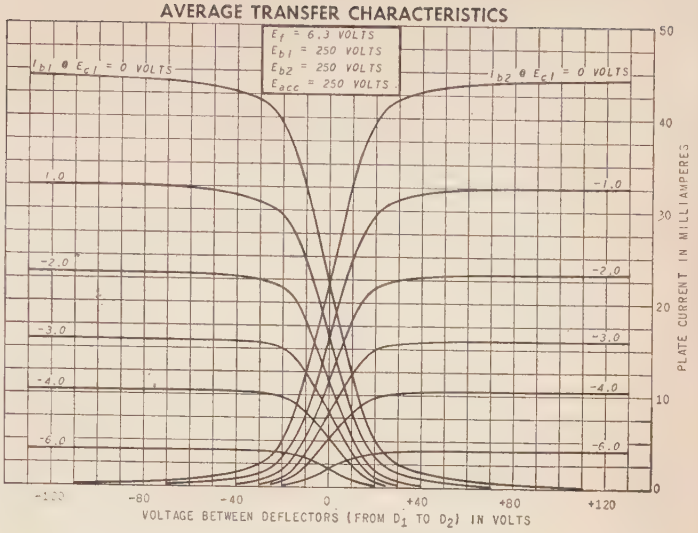


Fig. 5. Transfer characteristic of 6AR8 Sheet Beam Tube. Note the linear transfer characteristic over the deflection voltage range of −15 to +15 volts.

simple filter provides sufficient isolation between the circuits.

Pin ♯5 of the 6AR8 is a common connection to one leg of the filament and to the suppressor electrode and shield within the tube. It is necessary to ground this pin for proper operation of the tube. The other filament pin (♯4) is bypassed to ground with an .01 ufd. ceramic condenser to prevent energy leakage via the filament line. For best plate circuit balance, the cathode of the 6AR8 is unbypassed.

The Sideband Filter

The Collins F455D-31 Mechanical Filter is used to provide rejection to the carrier frequency and to the unwanted sideband. This unit is an electromechanical bandpass filter consisting of an input transducer, a resonant mechanical section comprised of a number of metal discs, and an output transducer. The input and output transducers serve as electrical-to-mechanical and mechanical-to-electrical coupling devices and do not affect the selectivity characteristics of the filter, which are determined by the metal discs. An electrical signal applied to the input terminals is converted into a mechanical vibration at the input transducer by means of magnetostriction. This mechanical vibration travels through the resonant mechanical section to the output transducer, where it is converted by magnetostriction to an electrical signal which appears at the output terminals of the filter.

For voice operation, a passband of approximately 2500 cycles is needed. Accordingly, the 3.1 k.c. bandwidth Mechanical Filter is used, having a passband as shown in *Figure 7*. The shape factor of this passband (ratio of bandwidth at 60 db. to bandwidth at 6 db.) is less than 2.25 to 1. The frequency of the beating oscillator is set so that the carrier is placed at one of the "20 db. points" on the filter curve. The oscillator frequencies for these points are approximately 453.5 k.c. and 456.6 k.c. By moving the oscillator from one frequency to the other either one of the two sidebands may be placed outside the passband of the filter and rejected.

The SSB signal appearing at the output of the filter may be converted to the frequency of use and amplified to the desired level.

A Practical SSB Exciter using the 6AR8

A 12AX7, 6AR8 and 6BA6 form the framework of a simple filter-type exciter as shown in *Figure 8*. A maximum audio signal of 0.10 volts, r.m.s. is required at the input grid of the 12AX7 audio amplifier for 5 watts of peak SSB output on 80 meters. The 12AX7 tube serves as a voltage amplifier and phase inverter, while the 6AR8 acts as the balanced modulator. The beating oscillator is a 6AU6 whose frequency is variable over the range of 450 to 460 k.c. A double sideband suppressed carrier is generated by the 6AR8 tube, and one sideband is rejected by the Collins Mechanical Filter which follows the modulator stage. The output of the filter is at a frequency of 455 k.c. A 12AT7 double triode mixer stage follows the filter, beating the SSB signal against a 3355 k.c. crystal conversion oscillator. The resulting SSB signal is on 3810 k.c. The SSB signal is amplified by a 12AU7 connected as a cascode amplifier, driving in turn a parallel connected pair of 6AG7's operating class AB1. These tubes deliver a SSB signal of about 5 watts peak power with negligible high order distortion products.

An audio signal of 0.10 volts r.m.s. (easily obtained from the usual variety of crystal microphone) is amplified in the two 12AX7

stages, producing a peak audio voltage of 22 volts to ground between each deflection plate of the 6AR8 (measured at pins 1 and 2). This is sufficient for complete electron beam swing at plate and accelerator potential of 300 volts. Approximately 5 volts of negative bias is applied to the 6AR8, resulting in a quiescent plate current of 6 ma. per section and a deflector current of less than 1 ma.

A peak-to-peak r.f. voltage of 3 volts is required from the 6BA6 electron coupled oscillator. The circuit shown is a modification of the standard Clapp arrangement, wherein the cathode r.f. choke has been replaced by a 1600 ohm composition resistor. This eliminates a bulky r.f. choke, and at the same time provides better waveform from the oscillator. Poor waveform in the low frequency beating oscillator can degrade the performance of the balanced modulator to a great degree. The output from the oscillator is taken from the cathode, since only a small mixing voltage is required.

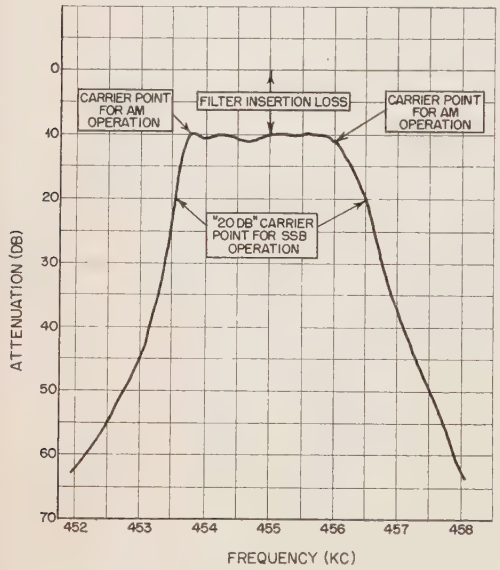


Fig. 7. Passband of Mechanical Filter

It is interesting to note that in the usual balanced modulator circuit the ratio of r.f. voltage to audio voltage is of the order of 10/1, or 20/1. That is, the carrier voltage must be 10 to 20 times the amplitude of the modulating signal for best linearity. Here, the situation is reversed. The modulating signal is just about 20 times greater than the carrier signal. Since the two signals are applied to different electrodes of the modulator tube, the old 10/1 or 20/1 ratio does not hold true.

Sufficient isolation must be provided in the power leads to prevent signal leakage between various stages. Since both the 6BA6 low frequency oscillator and the 6AR8 modulator are

Parts List for Figure 8

C1—100 $\mu\mu$fd variable ceramic padder Centralab 823-DN
C2—30 $\mu\mu$fd variable. Bud LC-1642
C3-C4—.002 μfd silver mica
C5-C6—250 $\mu\mu$fd mica. Series tuning capacitors for mechanical filter
C7—130 $\mu\mu$fd mica. Parallel tuning capacitor for mechanical filter
C8—Output tuning capacitor. 150 $\mu\mu$f Bud MC-1856
L1—2½ mh r.f. choke. National R-100
L2, L3—National XR-50 form, 22 turns #18e. ½" diam, ¾" long
L4—Bud 40-JEL (f 80 meter operation)
RFC-1 — 4 microhenr J. W. Miller 5221
RFC-2, RFC-3—2½" m lihenry. National 1 100
PC—50 ohm, 1 watt r sistor, wound with turns #22e. wire
MF—Collins 455 K mechanical filter, ty 455-D31
R1—Audio level contro 0.5 meg
R2—Modulator balan control, 3000 ohms
All .01 condensers a centralab ceramic ty DD

"hot cathode" circuits, it is imperative that th filament line supplying these tubes be close t ground potential at the carrier frequency o 455 k.c. A 0.1 ufd. condenser is placed acros the filament leads of the 6BA6 oscillator, an a 0.01 ufd. ceramic condenser is placed acros the filament pins of the 6AR8 socket. In addi tion a small r.f. choke is placed in the filamen line between these two tubes and the hig frequency portion of the exciter. As a fina step, the B-plus line is bypassed with a 0.5 ufd condenser, and is decoupled from the rest o the exciter with a 1,000 ohm decoupling re sistor.

The Low Frequency Oscillator

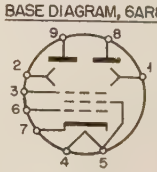
The 6BA6 oscillator is variable over a rang of about 10 kilocycles at 455 k.c. This allows the operator to change sidebands by moving the oscillator frequency from one side of the passband of the mechanical filter to the oppo site side. It is possible to transmit an ampli tude modulated signal consisting of the carrier and either the upper or lower sideband by placing the carrier at one edge of the filter passband. For normal SSB operation, the oscillator is placed on the slope of the passband, close to the 20 db. attenuation point, as shown in *Figure 7*.

Fig. 3. The 6AR8 Sheet Beam Tube. Designed for TV synchronous detector service, the 6AR8 may also be employed as a balanced modulator for SSB service.

Heater Voltage:
6.3 volts, 0.3 amp.
Envelope—T6½

Pin Connections
1—Deflector #2
2—Deflector #1
3—Accelerator grid
4—Heater
5—Heater, shield, focus electrode
6—Control grid #1
7—Cathode
8—Plate #2
9—Plate #1

BASE DIAGRAM, 6AR8



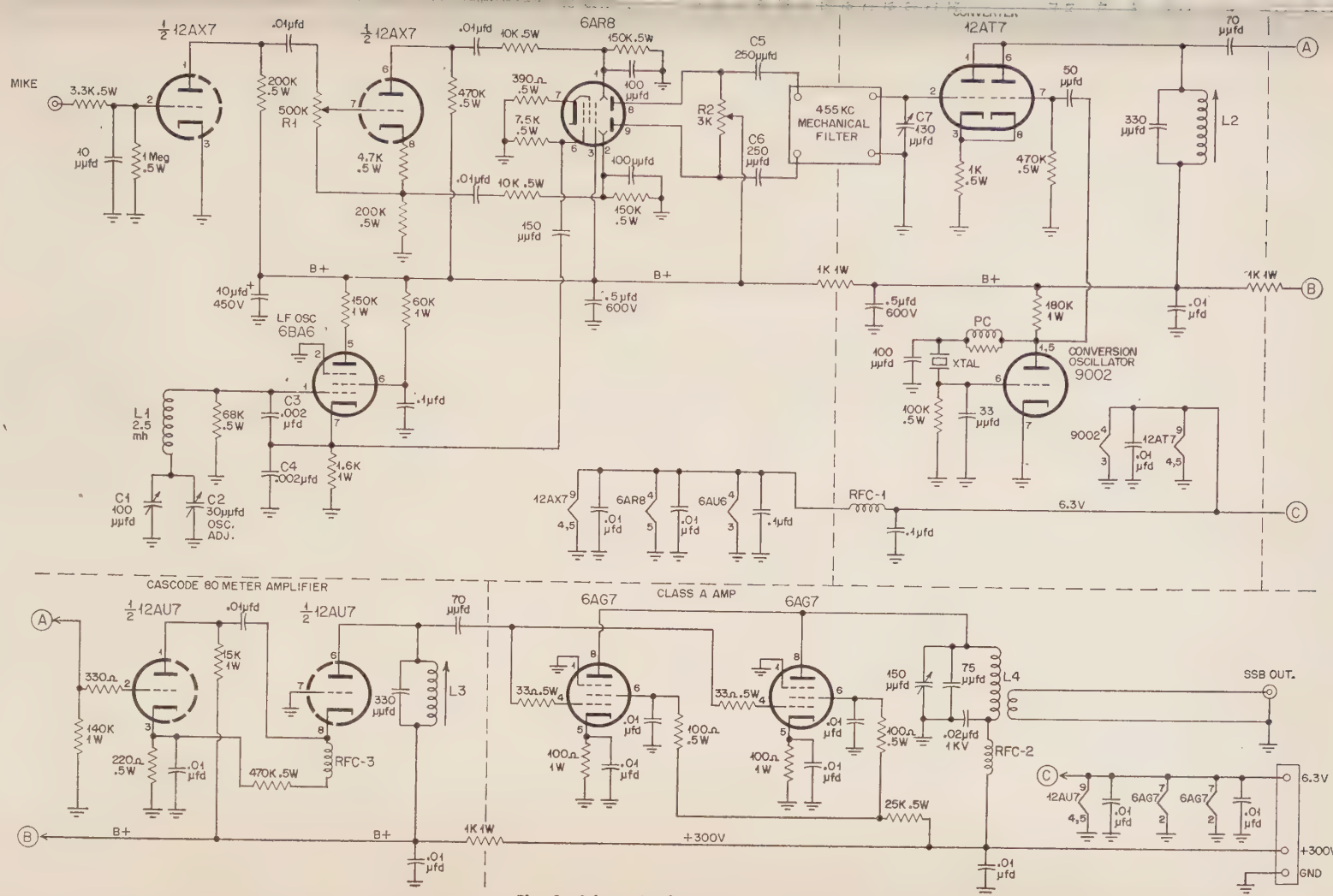


Fig. 8. Schematic, SSB 80 Meter exciter.

The Q of the inductance used in the oscillator grid circuit determines the value of the silver mica padding condensers that are connected from grid to cathode and from cathode to ground of the 6BA6 oscillator tube. With a low-Q coil, these condensers may have to be decreased from the indicated value to .001 ufd. apiece to maintain oscillation of the stage. The effect of these condensers upon the frequency of oscillation is minor, since the frequency determining elements are placed between the coil and chassis ground. The larger the capacity of the padding condensers, the better will be the stability of the oscillator. A good quality 2½ millihenry r.f. choke (National R-100) used in this circuit will allow .002 ufd. padding condensers to be used across the tube elements.

The resonant frequency of the 6BA6 grid circuit is determined by the series padding condenser connected across the oscillator tuning condenser. Too little capacity at this point in the circuit will cause the 6BA6 stage to stop oscillating. The remedy for this is to remove a few turns from the oscillator coil and to add sufficient padding capacity to restore oscillation.

Sideband Filter and 80 Meter Stages

The 6AR8 modulator stage is coupled to the mechanical filter which is series tuned to provide proper impedance match to the modulator. The value of the series tuning capacity will vary with the type and model of filter used. The series capacity removes the d.c. plate voltage from the filter coils. As stated earlier, the carrier balance of the 6AR8 stage is set by a potentiometer control in the plate circuit.

The output circuit of the mechanical filter is parallel tuned to 455 k.c. A SSB signal of about 0.2 volts peak is obtained at this point. A 12AT7 double triode is employed as a conversion mixer to the 80 meter band. The SSB signal and the 3-Mc. mixing carrier are applied to individual grids of the triode sections, and the two signals are mixed in the common plate circuit which is tuned to the sum frequency, which falls within the 80 meter phone band. A 12AU7 cascode stage follows the mixer and amplifies the SSB signal to a level suitable to drive the parallel 6AG7 tubes to a peak power of about 5 watts.

The 12AU7 cascode stage provides a voltage gain of about 90 without the need for parasitic suppression and/or stabilizing circuits that are usually needed in high gain pentode circuits. The plate circuit of the cascode stage is high-C, which helps to further reject the fundamental signal of the crystal controlled conversion oscillator.

The parallel connected 6AG7 output stage employs screen parasitic suppression and series grid resistors to insure stable operation. The stage is not neutralized and tends to be slightly regenerative, raising the intermodulation figu of the transmitter by a measurable amoun The high order products of the transmitter a about 30 db. down from the peak outpu which compares favorably with the majority good amateur SSB signals, and which sets shining example for some of the mediocr SSB signals that can be heard on the amateu bands from time to time.

Exciter Construction

The SSB exciter is built upon a 8″x12″x3 aluminum chassis which is divided into com partments to insure that various signals an r.f. voltages stay where they belong. A to view of the exciter is shown in *Figure 9* and bottom view in *Figure 10*. The 12AT7 speec amplifier, 6AR8 modulator and 6BA6 low fre quency oscillator are in one compartment. Th center compartment contains the 9002 cor version oscillator and the 12AT7 80 mete mixer. The remaining compartment is divide in two. The smaller section contains th 12AU7 cascode stage, and the larger half cor tains the parallel 6AG7 amplifier stage. A filament and plate leads to these last two stage pass through bulkhead-type condensers whic are mounted in the shield partitions, insurin that the shields are not "short circuited" b power lead coupling loops. When a botton plate is placed under the chassis, the stage isc lation is of a high order.

It is necessary to shield the 9002 conversio oscillator and the 12AT7 mixer tubes, or ther will be undesirable coupling around the me chanical filter between the low frequenc stages and the 80 meter stages. This couplin will tend to mask the excellent skirt selec tivity of the filter. A shield over the 80 mete conversion crystal is also needed. A minut amount of stray coupling existed between th conversion crystal and the 6BA6 low frequenc oscillator tube, even though they were locate six inches apart on the chassis. After the uni had been run for a time, tube shields wer placed on all tubes with the exception of th 6AG7's, with a measurable improvement i sideband suppression and skirt selectivity o the filter. When a filter provides some 80 db of unwanted sideband rejection, as does th mechanical filter, it does not take much stra leakage around the filter to ruin the passban of the unit. Careful attention to details wil reduce this unwanted coupling to a minimum

Exciter Adjustment

Adjustment of the exciter is relatively sim ple. The 6BA6 oscillator is so tuned that 45 k.c. falls at mid-scale on its tuning control which may be labelled "Upper-Lower Sideban selector". The SSB signal at the output of the mechanical filter may be introduced into the i.f. section of a monitor receiver by a short

length of coaxial line. The oscillator may then be heard as it is tuned across the passband of the mechanical filter. The 80 meter conversion oscillator may now be monitored for operation, and the low frequency oscillator may be heard on 80 meters as it passes across the filter "window".

The next step is to adjust the balance potentiometer in the plate circuit of the 6AR8 stage for minimum 80 meter carrier at the SSB frequency. The sideband oscillator is then tuned just outside the filter passband, and an audio signal is applied to the exciter. If available, a sine wave of about 2000 cycles should be used, at a level of less than 0.1 volt, r.m.s.

The signal heard at the 80 meter SSB frequency should be a steady carrier with little trace of the 2000 cycle tone. Any tone that may be heard is a result of the sideband beating with the residual carrier and with high order distortion products. When received on a superhetrodyne receiver with no beat oscillator, the SSB test signal with pure tone modulation should sound like a carrier, with perhaps just a trace of light tone modulation.

The output circuit of the mechanical filter should be tuned for maximum SSB signal, as should the plate circuit of the 12AT7 mixer. The 12AU7 cascode amplifier is next plugged in, and the plate circuit of this stage adjusted for maximum SSB signal. The same step is followed for the 6AG7 stage. The 6AG7's may be loaded with an automobile headlight lamp which will serve as a dummy load. The bulb will light to about one half brilliance under full SSB output. When voice modulation is applied to the exciter, the signal should be completely unintelligible until the receiver BFO is turned on and properly adjusted. The speech should be clear and crisp, and no "buckshot" should appear in the spectrum where the rejected sideband lies. Care must be taken to make sure that the amplifier stages are not tuned to the frequency of the 9002 conversion oscillator, since these tuned circuits offer the only rejection to this signal.

When modulation is removed from the SSB exciter, the lamp load should go out. Any residual glow is an indication of carrier leakage, or of leakage of the conversion oscillator signal through the amplifier stages.

By pushing the exciter, almost 10 watts of output may be obtained, but the higher order distortion products increase sharply in value and the SSB signal is adorned with undesired products falling in the unwanted sideband, and outside the limits of the wanted sideband. At a conservative level of 4 or 5 watts, the signal is clean and sharp.

Conclusion

The exciter is a simple unit to get working, the important adjustments being the setting of the carrier-null potentiometer in the 6AR8 stage. The exciter may be tuned up with the S-meter of the station receiver. If a good audio oscillator is at hand, the null control may be adjusted by merely tuning it for minimum intermodulation on the 80 meter signal, or minimum 80 meter carrier when the 6BA6 oscillator stage is in the center of the passband. A little experience will show the best position of the oscillator on the filter slope.

The output of the exciter is sufficient to drive a pair of 807 or 6146 tubes to 100 watts or so. It has also been used to drive a Class AB1 4-400A to about 500 watts on 80 meters.

The author wishes to thank Chandos Rypinski, W6RDR, of *Electronic Industries, Inc.*, Burbank, Calif. for his original suggestion of this application of the 6AR8 tube and for his subsequent design suggestions, and the Tube Division of the *General Electric Co.* for supplying pre-production samples of the 6AR8 tube. ■

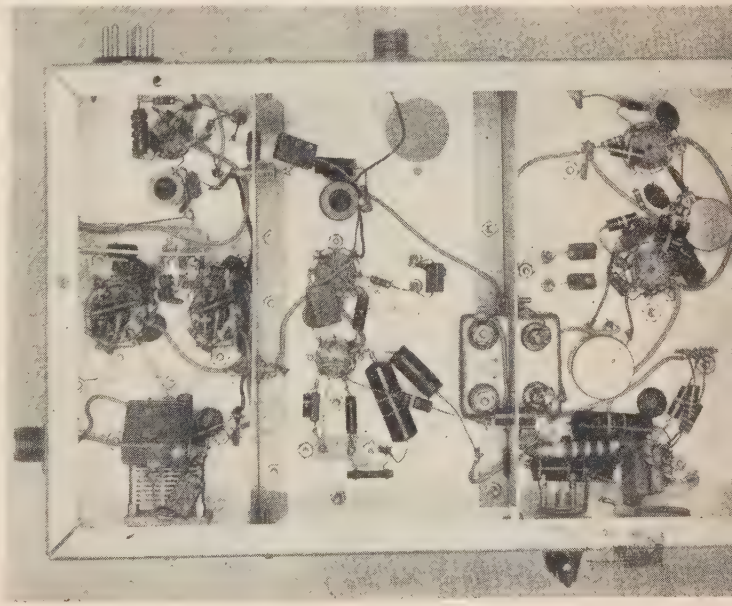
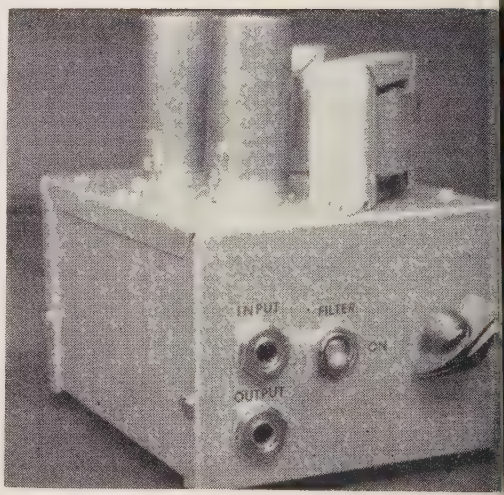


Fig. 10. The output amplifier and cascode stages are in the left hand compartments. The center compartment contains the mixer and oscillator stages. At the right are the low frequency and audio stages. The mechanical filter (atop the chassis) bridges the right hand compartment shield. The input circuit of the filter falls in the low frequency compartment, while the output circuit falls in the mixer compartment.

a Filter-Limiter

for C-W Reception

Allan M. Ferres
267 West 11th Street
New York City 14



If noise limits the number of your c.w. contacts, this audio filter-limiter will help. It is non-ringing and requires no receiver modifications. It is not a revolutionary new device, but it does cut both receiver and outside noise considerably and it is inexpensive and simple to put together.

Filters to reduce the audio bandwidth of c-w receivers usually use an LC parallel resonant circuit or a sharp cut-off low-pass pi network. Unless the parallel resonant circuit is properly loaded, the resultant ringing is often as annoying as the noise it attempts to eliminate. Unfortunately this proper loading widens the pas band of the circuit and tends to defeat th purpose of the filter. A well designed low-pa network is free of this trouble, but receiver hu and low-frequency man-made noise are n adequately reduced. The more complicate phase-shift, feedback type of circuit, such as th "Select-O-Jet", can be more effective than eith of the above, but requires additional tubes t provide adequate limiting.

The filter-limiter described here consists o two tuned amplifiers in cascade, separated by cathode-coupled limiter. Each tuned stage one-half of a 12AU7 with the load divided b tween the plate and cathode circuits. The cath ode load is shunted by a series LC circuit whic offers a low impedance at its resonant frequenc At resonance, therefore, the degeneration pro duced by the cathode load is minimum and th gain of the stage is maximum. The part value have been chosen to produce a maximum stag gain of one. Although the Q of each tune circuit is low enough to prevent ringing at th

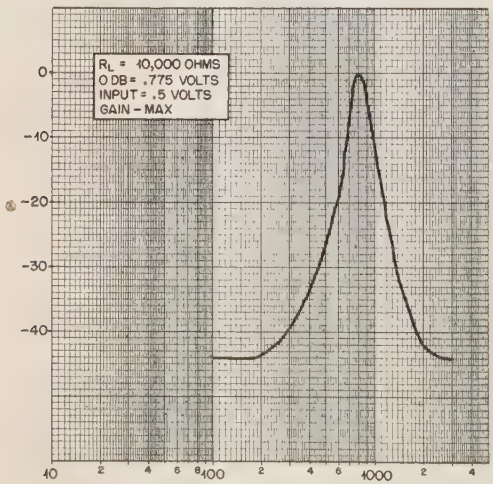


Fig. 1. Frequency response

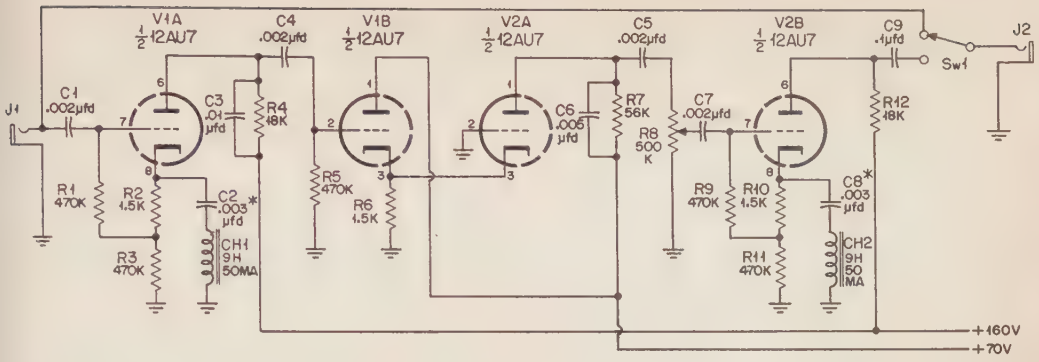


Fig. 3. Schematic for the Filter-Limiter

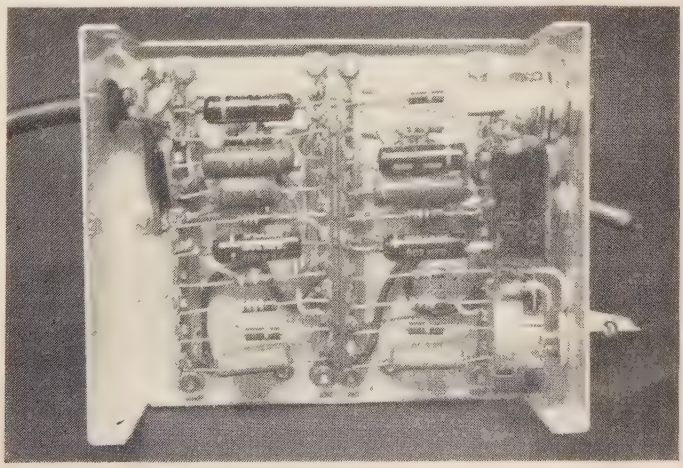
resonant frequency, a slope of 34 db per octave is obtained. This is a good compromise between noise rejection and ease of operation. The overall frequency response of the unit is shown in *Figure 1*. Too sharp a response curve may cause difficulty in holding the signal when receiver or transmitter frequency drift is encountered.

The function of the limiter is to prevent noise and signal from exceeding a definitely established maximum. This relieves the operator from the strain of having to contend with the ear-shattering crashes of noise bursts, key clicks or strong interfering signals. The limiter also employs a 12AU7 connected in a cathode-coupled circuit. The limiting characteristics, shown in the input/output voltage curve of *Figure 2*, indicate that limiting starts at about one volt input and that the output voltage cannot exceed one and three-quarter volts with the gain control of the unit at maximum.

The filter-limiter shown in the photographs was built in a 3 x 4 x 5" aluminum case and the power supply in a 2¼ x 2¼ x 5" case. The power supply, *Figure 4*, must be on a separate chassis from the filter-limiter in order to prevent hum pickup between the power transformer and the tuned circuit chokes. The complete unit draws only about two milliamps at 160 volts and .6 amps at 6.3 volts. If this power is to be obtained from a supply now in use, *R15* and *C12* should be included on the filter-limiter chassis. Because of the narrow bandwidth and the low gain of the unit, no special wiring precautions need be taken nor is shielded wire necessary for any of the connections. All resistors and condensers are mounted on the four *Cinch-Jones* type 2010 ten-terminal strips, which are attached to the bottom of the chassis. After the first model was built, it was found that it would have been more covenient to mount the input and output jacks on the back drop of the chassis and to move the on-off switch, *S1*, to the left side of the front panel. It is suggested that the builder make these

Parts List

R1, R3, R5, R9, R11—470,000 ohm ½ w. res.
R2, R6, R10—1500 ohm ½ w. res.
R4, R12—18,000 ohm ½ w. res.
R7—56,000 ohm ½ w. res.
R8—500,000 ohm audio-taper pot
C1, C4, C5, C7—.002 μfd., 400 v. cond.
C2, C8—.003 μfd., mica cond. (see text)
C3—.01 μfd., 200 v. cond.
C6—.005 μfd., 400 v. cond.
C9—.1 μfd., 200 v. cond.
CH1, CH2—9. hy., 50 ma. choke (Stancor C-1215)
S1—s.p.d.t. toggle switch
J1, J2—open circuit phone jack
V1, V2—12AU7 tube



Filter-Limiter, bottom cover removed

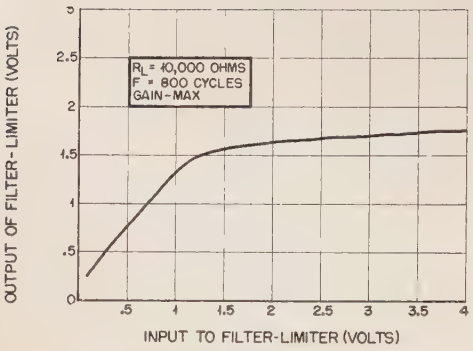
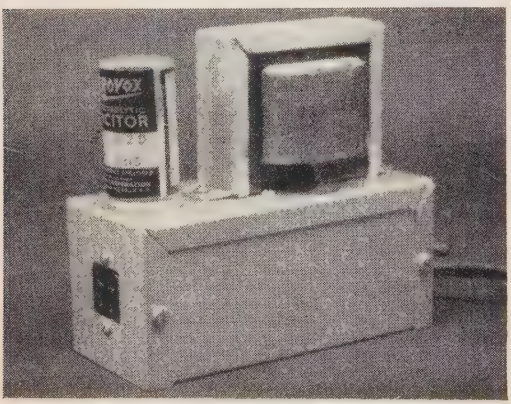


Fig. 2. Limiter characteristics

changes as the front panel would then be less crowded. The two chokes are mounted at right angles to each other to reduce the coupling between them.

The circuit diagram, *Figures 3 & 4*, requires little explanation. Except for *C2* and *C8*, no part values are critical. 10% tolerance resistors and ordinary paper tubular condensers can be used, except as noted below.

Although 20% tolerance mica condensers can be used for *C2* and *C8*, the sharpest peak will be obtained if these two condensers are selected to tune the two chokes to exactly the same frequency. The author has found that less



Miniature power supply for the Filter-Limiter

operator fatigue occurs when copying code with an 800-cycle note, but any tone between about 700 and 1200 cycles can be used if preferred. The circuit, of course, should be tuned to the preferred tone.

Tuning

Before tuning the circuit, the wiring of the filter-limiter should be completed except for *C2* and *C8*. Connect an output meter or an ordinary a-c volt-meter to the output jack, *J2*, and set the gain control to maximum. Feed an 800-cycle signal into the input jack, *J1*. If an audio oscillator is not available, beat the b.f.o. of the receiver to the station's v.f.o. or frequency standard so as to produce a tone of approximately 800 cycles, and connect *J1* to the phone jack of the receiver. Temporarily wire in *C8* and short out *R3*. Reduce the 800 cycle tone to the lowest level which will give a useable reading on the output meter. Now vary the frequency of the tone to produce the highest reading on the meter. If this tone is close to 800 cycles, wire in *C8* permanently. If too high or too low, try other condensers until the 800 cycle peak is obtained. The next step is to remove the short across *R3* and try various values of *C2* so that the highest output is obtained at the peak frequency.

To obtain best results from the filter-limiter some experimenting with the receiver controls will be necessary. It is important not to set the receiver gain controls too high or the signal will go too far into limiting, causing an apparent increase in noise level. The selectivity

Power supply, bottom cover removed

should be set to as broad a position as interfering signals will allow. The gain control of the filter-limiter is adjusted for comfortable headphone level, but no higher than necessary.

It cannot be predicted in advance exactly how much noise reduction this filter-limiter will provide in any given case, but if noise does interfere with code reception, then enough improvement will be furnished to make the use of the unit well worthwhile.

The author wishes to thank Mr. Benjamin Lazarus, W2JB, for his suggestions and help in testing this "Filimiter" at his station in midtown Manhattan which must be one of the noisiest locations in the country.

Power Supply Parts List

R13—47 ohm 1 w. res.
R14—10,000 ohm 1 w. res.
R15—47,000 ohm 1 w. res.
C10, C11, C12—30/30/10 μfd., 150 v. elec. cond.
F1—½ amp fuse
T1—Power trans. 125 v. half wave @ 50 ma. 6.3 v. @ 2 amps (Stancor PA-8421)
S2—s.p.s.t. toggle switch
Rect.—20 ma. selenium rectifier

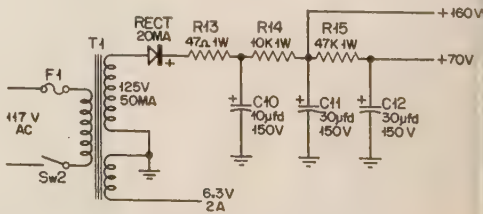


Fig. 4. Filter-Limiter power supply

The Gonset G-66 Receiver

Wayne Green, W2NSD
Editor CQ

The G-66 has been on test for well over a month as this is written. It took a great amount of will power to wait this long, for the inclination after only one day's test was to sit down and let everyone in on the amazing results. But since you find out more about a piece of equipment as you live with it, that first flush of elation and optimism usually passes. This one hasn't.

The more I use the G-66, the more in awe I am. Here is a tiny receiver that will stand up there right along with the best on the market. Car receivers are normally expected to be sensitive so it comes as no surprise to find that you can hear anything with this mite that you can pick up with a $600 communication receiver. It is *hot*. Tested in the car there was a marked improvement over the previous receiver which has served well for the last two years.

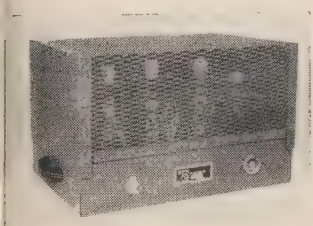
My previous mobile setup consisted of an all-band converter, separate i-f strip with audio and speaker, and broadcast receiver. All this took up quite a bit of room and probably cost over double the G-66 tag. The G-66 is a complete communications receiver with all ham bands and the broadcast band built in. Further, the power supply works from either 6 or 12v battery, or house current.

But I've just been teasing you along. The greatest news about this receiver is the stability. If I hadn't tested it myself, I would never have believed it. In talks with other mobileers and SSB'ers, one factor has always been a stumbling block for mobile SSB: No one had found a receiver that would not drift excessively during normal operation of the car. I had in the past managed to work a few SSB stations, but I usually had to have one hand on the BFO knob. It was enough of a problem to discourage any extensive SSB installations in the car. This was unfortunate, for everyone that has tried mobile SSB has found it to be **the** answer to nearly all the complaints of the mobileers.

The G-66 has a clever gain control that is a combination of a.f. and r.f. With this system you only have one knob to work and don't run into cockpit trouble. Once you tune in the SSB station he stays tuned in, even with the generator going on and off. I tested the receiver with battery voltages of from five to nine volts and the change in the SSB voice was negligible. Used in the shack there was no difference between the operation of the G-66 and the regular station receiver. I tuned in an SSB station and changed from battery to a.c. and the voice never quavered.

The one place where you have to take a bit of sacrifice for size and price in this unit is in variable selectivity. The selectivity of this unit is ideal for mobile operation, but for home use where you have two hands available you might want to add a Q-multiplier to narrow down the 3½-kc passband. Make it a 265-kc Q-multiplier. The G-66 is a double conversion receiver with a 265-kc second i.f. This low frequency i.f. makes for good selectivity.

There are too many features to point up in this article. Inspection of the literature on the G-66 will probably give you adequate instruction along this line. The design is beautiful, there is loads of bandspread, no backlash to the dial, simple bandswitching, provision for VFO zeroing, muting connections, simple dial recalibration system, S-meter, excellent noise limiter, good BFO, phone jack, and what else do you want? The price tag on the receiver is $169.50; the power supply (6-12-115) is $39.95. ■



ULTRA MODULATION

Want to put 225 watts of audio on a little old 50-watt carrier? I mean without messing up the whole south end of the band and setting the videos for miles around a-flutter? 'Tis possible. The villain in the piece, of course, has always been the negative half cycle, and the Ultra Modulation Company claims for their unit complete control of the negative half cycle of the modulation unit for the first time in radio history. With this unit, audio power up to 5 times the carrier power has been successfully used, with bandwidth never in excess of a conventional 100% modulated carrier. A newly-patented system is at the heart of this system that succeeds where others failed. And, brother, 225 watts of modulation on a 50-watt carrier will give you a lot more punch than many AM Kw's now on the air. Try it and see. For the lowdown on Ultra Modulation, drop a line to Ultra Modulation Company, P.O. Box 485, Red Bank, New Jersey.

Getting db the easy way

a five element Quad Yagi for two mete

Richard A. Jensen, W2MGF
26 Sanders Road
Nixon, New Jersey

Here is a beam that is easy to make, easy to adjust, and easy to erect. It has the gain of beams considerably larger in size. This lightweight simple array can be mounted on a standard TV mast and rotator where the larger more bulky arrays require a tower and a heavy duty (expensive) rotator. There are no phasing lines to be adjusted and no impedance matching transformers are necessary when 75 ohm coax is used.

Quads have been a source of confusion for some time. Though there have been several articles in print on the subject, few hams have felt that these published versions exploited the full possibilities of such a device. The January 1955 *QST* article on a twenty meter Quad using two single turn loops aroused my curiosity as to the results of throwing in a director in addition to the reflector.

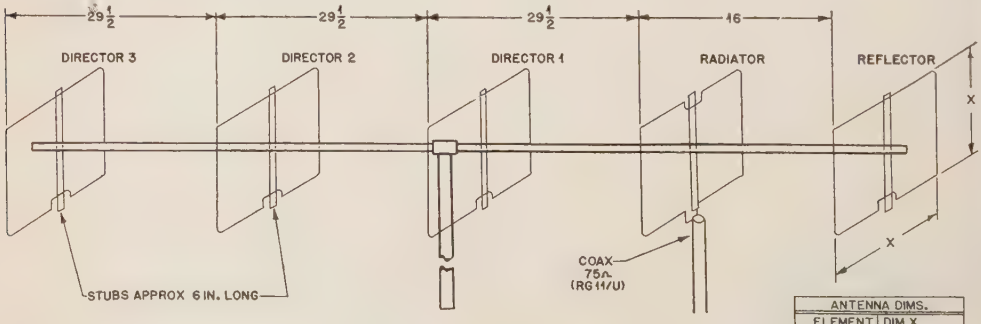
Investigation of the use of director loops was started in April 1955 with construction of a six meter beam using a Cubicle Quad with one director loop spaced at 0.2 wavelength. The six meter beam worked quite well and it was my belief that a worthwhile increase in gain was attained by adding a director loop. Further investigation of what could be done with more than one director was carried out on 144 mc rather than at 50 mc. To distinguish the design of this beam from others I decided to call it a Quad Yagi which is appropriate since it is a Quad beam with a number of parasitic e ments as in a Yagi beam.

Facts & Figures

All of the information presented was fou experimentally. Spacings of the elements we adjusted for optimum forward gain except t the reflector which was determined for b front to back ratio and is 0.2 wavelength, t same as was used in the earlier Cubicle Qu beams. Closer reflector spacing resulted slightly lower gain and a broader pattern, wh larger spacing caused a more rapid decrea in the gain but also generated minor lobes the back corners. Spacing of the directors w adjusted for best forward gain and turned c to be ⅜ wavelength.

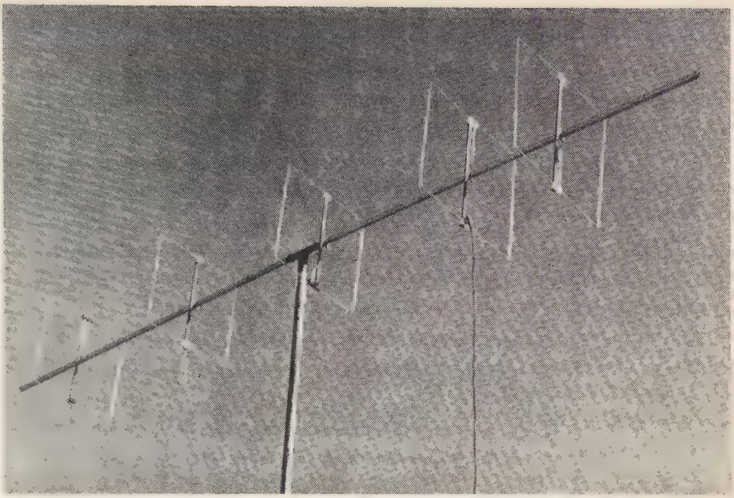
A dipole with a diode and a milliamet calibrated in db was used as a field streng meter to make gain measurements. Sever measurements were made of the gain over reference dipole at two different locations a a gain of between 13 to 14 db was obtaine This is about what can be obtained with "Twin Five" Beam that is properly phased.

A rough plot was made of the field patte of the beam and is shown in *Fig. 2* in com parison with a barefoot Cubicle Quad antenn to show the decrease in beam width caused b the addition of director loops. The front-t back ratio was found to be about 45 db and th



ANTENNA DIMS.	
ELEMENT	DIM X
REFLECTOR	21½
RADIATOR	20½
DIRECTOR 1	19
DIRECTOR 2	19
DIRECTOR 3	19

Fig. 1. Construction information



Completed beam at W2MGF

front-to-side ratio was close to 60 db. The beam width at the half power points was about 30° in the horizontal plane and about 20° in the vertical plane.

Measurements of the S.W.R. with 75 ohm coax was made over the two meter band and was 1.04 at the frequency for which the beam was tuned. It increased to 1.5 at the high frequency end of the band. With the directors spaced at ¼ wavelength the S.W.R. was 1.02 at the low and rose to 1.4 at the high frequency end of the band. *Fig. 3* shows the curves ob-

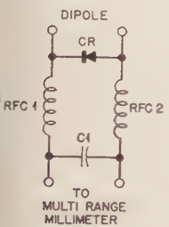


Fig. 4. Tuning indicator.

ained from these measurements. An unbalnced feed was used for the sake of simplicity, owever a Balun should give better current listribution in the driven loop and might bring bout a slight improvement of the gain.

Not only was the impedance match good ver the 144 mc band, but the gain was contant across the band. The beam, though adusted at 144 mc, performed equally well up o 148 mc.

From the experimental work with the Quad 'agi it was found that loop dimensions can eadily be calculated. The length of the driven oop is one wavelength and its length is $L(\text{feet}) = \frac{984}{f(\text{mc})}$. This is longer than that f a straight wire in free space, which is due o it having no end effects. The design of my eam was calculated for loops slightly shorter han for free space length to allow each elenent to be tuned with a short stub. Directors were all made the same length and their stubs had sufficient tuning range for proper adjustment.

Construction

The construction of the beam is quite simple and can be made from readily available materials at low cost. All materials can be obtained from the local hardware or radio supply store at a cost of less than ten dollars. In figure #5 one loop is shown in detail. Dimensions of each loop is tabulated on *fig. 1*. Aluminum solid clothes line wire was used for the elements and is supported by ½″ fibre tubing. Dowel rod can be substituted for the support if it is treated to resist the weather. The aluminum brackets which hold the wire to the support are formed from sheet aluminum, and the mounting boom is 1″ dia. aluminum tubing both of which are sold in hardware stores by Reynolds "Do-It-Yourself" aluminum. Suitable mounting clamps for attaching the loops to the boom and also clamps for mounting the beam to the mast can be obtained at most T.V. supply houses.

[*Continued on page 118*]

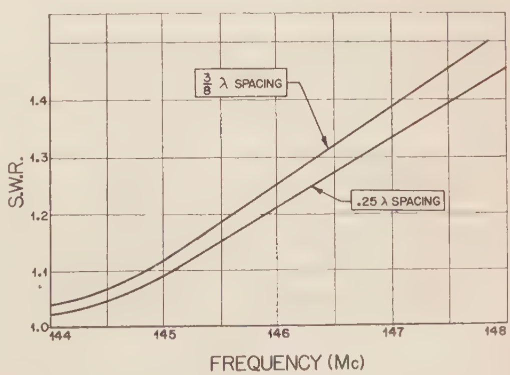
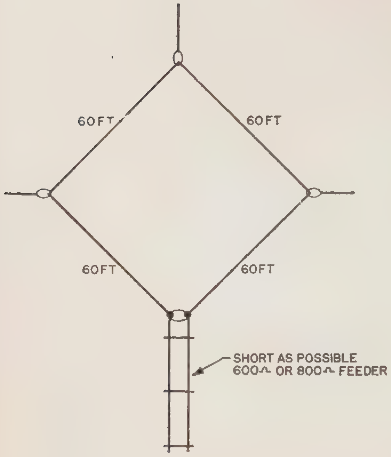


Fig. 3. S.W.R. v. frequency change.

Work Locals with a

Lazy Quad

M. F. "Doug" DeMaw, W8HH
9601 South 47th Ro
Cadillac, Mi



Since the opening of the 75 and 20 meter phone bands to General Class use, the QRM situation has become so severe that the old familiar phrase, "Armchair Copy", is being heard more infrequently as time passes. This seems to be particularly true on the 75 meter phone band. Night time band conditions seem to be especially trying these days. The most fortunate operators who do maintain a higher average of solid contacts are equipped with the higher power and more elaborate antenna systems. But what of the fellows with restricted space for antennas? Those of us who for either economical or various practical reasons, do not run high power, in fact in many cases run less than 100 watts input? Generally speaking, unless being blessed with an occasional run of good fortune (such as enjoying a particularly good location or one of those crazy unexplainable hot antennas) we just don't stand a chance when conditions are crowded.

The antenna to be described is not new in principle nor is it difficult to erect or use. However, it seems to be one of the most neglect ideas of the present era. The antenna will n produce any unusual results as far as DX concerned, but on statewide contacts up to 4 miles it has proven itself to be far superior the half wave doublet 45 feet in the air a much more desirable than a 375 foot, wave a a half long wire. The antenna in question is t full wave loop (closed loop type). This anten erected in a horizontal plane produces princ pally high angle radiation, don't wince wh you read this. I realize that the modern d trends seem to be more and more toward l angle radiators for DX work. This article intended for those who want to maintain mo solid local and net QSO's.

The natural properties of a full wave lo indicate that the maximum amount of radiati occurs at right angles (or perpendicular) to t plane that the antenna is mounted in. Therefo it is safe to assume that if the loop we mounted parallel to the ground, the maximu effective radiation would be straight up in the sky. This situation upon further thoug seemed like an ideal condition for those go solid, local, short haul contacts. After making few simple calculations I rounded up 240 fe of antenna wire and some insulators and we to work. A few natural supports such as tre and buildings were well situated for erecti the antenna in a square configuration. T maximum available height was only 25 fe but for the sake of experimentation I decide this would be adequate for the initial chec The completed antenna was 60′ on a side a as nearly level with respect to the ground possible. A short length of 600 ohm open wi line was used to feed the antenna from the u stairs location of the shack.

Coupling Methods and Loading

Considerable experimentation became nece sary in order to achieve proper antenna loadin *Figure 2* shows the two most desirable metho used. The antenna manual states that the fee point impedance on a full wave closed loop in the vicinity of 50 ohms. This was tried wit RG8-U and proved to be totally unsuccessful. system of series tuning was finally decided upo and the transmitter loaded readily.

[*Continued on page 120*]

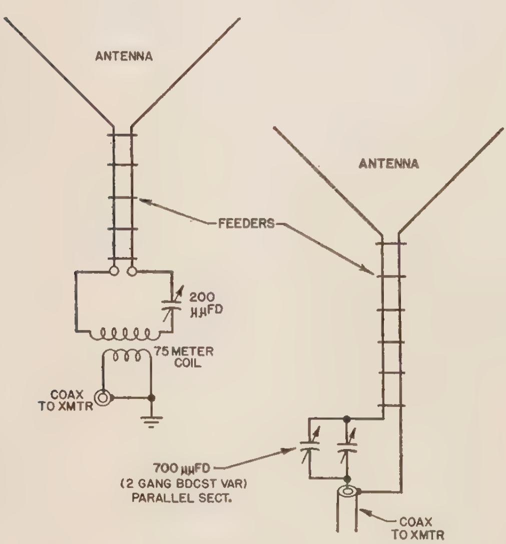
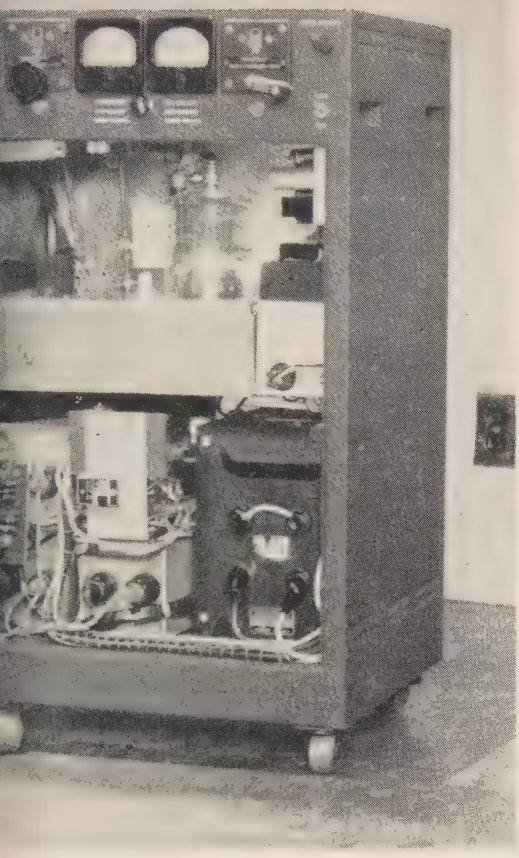


Fig. 2. Loading.



One Man's Linear

Haven't you built a linear yet?

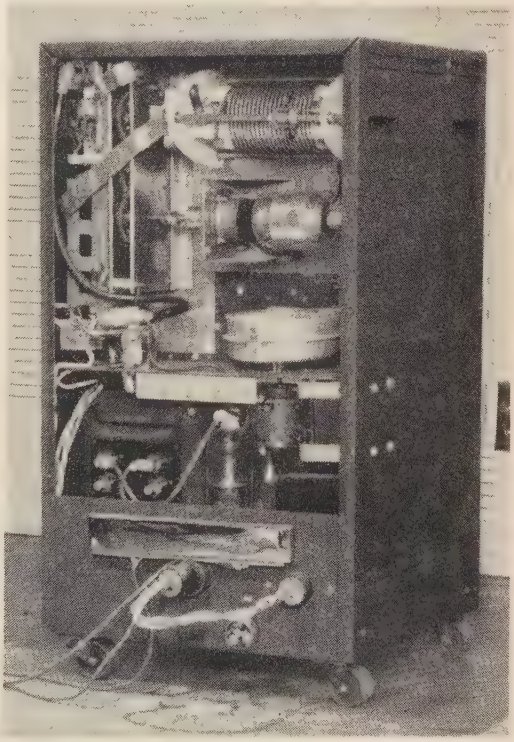
John W. Govier, W8QNW
18670 Gilchrist
Detroit 35, Michigan

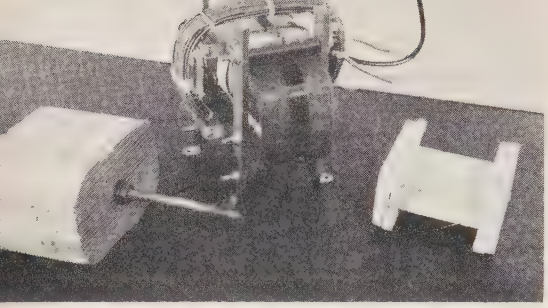
A few of your readers might be interested in a quick rundown on my new linear. I won't go into the circuit for that is pretty standard. The cabinet comes from the *Collins* KWS-1 power supply unit and was picked up here in Detroit. I understand that more of these may be available in the future. A 36″ relay rack would have given a bit more working space, but the other was handy.

The amplifier works from 80 through 10 meters and the whole works is in the cabinet: plate, screen, and grid bias power supplies. An Eimac 4-400A was used, but many other tubes could have been substituted. The left hand meter measures all circuit currents and voltages plus one position for antenna loading. The right hand meter reads plate current. Write Eimac for info on running their tubes linear, it is available for the asking.

The linear can be driven AB_1 or AB_2 with most commercial SSB exciters. The output circuit is a pi network with a variable inductor and a *Jennings* vacuum variable capacitor. This gives a maximum of 1500 $\mu\mu$fd and a minimum which will load a coax fed ten meter beam without switching. The inductor and condenser are geared together to provide a constant Q of 15 throughout the range.

So, there is one way to put together a linear. I'll leave the details to you on building yours. ■





The completed transformer before application of varnish and the two wooden block forms used for winding primary and secondary.

C. B. Adelmann, K6EY
760 Via Marin
San Lorenzo, California

Low Capacity Transformers

for Grounded Grid Applications

Anyone who has had plans to build a high power final must certainly have read the recent series on grounded grid linears with a great deal of interest. This writer began collecting parts for such a final, but when it came to the procurement of the low capacity filament transformer, it appeared there would be some difficulty. After a long and exhaustive search of the local surplus stores, the conclusion was that they wouldn't become available through those channels. Now our supply of catalogs is pretty extensive, but searching them revealed that none of the manufacturers are producing them, at least for distribution to jobbers or wholesalers. A quotation on such a transformer was obtained from a local manufacturer, but the cost of building a single unit was prohibitive. Apparently, if we were going to go ahead with the project, we would have to go back to the now almost unheard of practice of winding our own.

It is not difficult to find information on the design and construction of power transformers, but most of it is for the conventional type and if any data exists on low capacity transformers, it must be in the hands of those manufacturers who built them for the military. A low capacity transformer is merely one which has its secondary far enough removed from its primary to give a minimum of capacitance to the grounded leg of the source of a.c. In removing the secondary in this fashion, the regulation under load would naturally be less than in a transformer whose secondary is in close proximity to the primary. Lack of information on what could be expected made the design difficult, but finally a secondary was constructed with enough taps so that the proper voltage under load would be obtained. After the regulation was determined, a new secondary was then wound so that excess turns would be eliminated and the capacitance to the primary would be at a minimum. In actual practice, manufacturers have achieved most efficient designs through the same method since a practical transformer always differs slightly from the ideal, and such things as number of turns per volt and core area are determined from experience.

How to figure it

To avoid repetition of theory which can be found in any handbook, only the information necessary to design such a transformer will be shown here. The first consideration is the cross sectional area of the core and this may be calculated as follows:[1]

(1) $$A = \frac{\sqrt{E_s I_s}}{5.58}$$

E_s = Secondary Voltage
I_s = Secondary Current

After determining the core size to be used the number of turns in the primary are found from the formula:

(2) $$N = \frac{E_p \times 10^8}{4.44\ f\ BA}$$

Where:
E_p = Line voltage
N = No. of turns
F = Frequency of supply source in cycles
B = Flux density in line per square inch
A = Core cross section (net) in square inches

The quantity B is determined by the type of material to be used in the core, but for core materials now available a figure of 90,000 is usually used. Remember that A is *net* area and a stacking or space factor must be applied for laminated cores. If a core were fabricated from an old transformer core and a good grade of varnish applied to the laminations, this factor would be about 90% with .014 material. The other relationships which apply are:

$$\frac{N_p}{N_s} = \frac{E_p}{E_s}$$

This merely is another way of saying that the number of primary and secondary turns is in direct proportion to the primary and secondary voltages. The current in primary and secondary windings, however, is in inverse proportion to the respective voltages or:

(4) $$\frac{I_p}{I_s} = \frac{E_s}{E_p}$$

which, of course, assumes no losses as in the ideal case. Actually, the primary current will be the sum of the current as found from (4) above, plus the current required to magnetize the core and such current as necessary to account for other losses.

Specifically

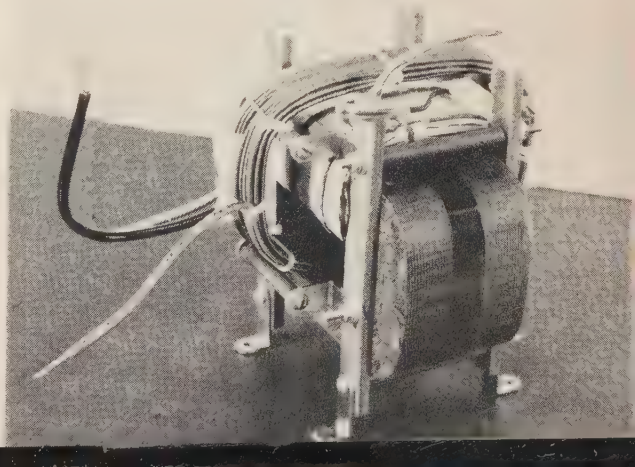
The transformer described in this article contemplates using a single 813 in the final, therefore, it must deliver 10 volts at 5 amps. Using formula (1), the net core area is found to be 1.27 square inches. To provide for spacing the secondary far enough away from the primary, a "C" type core must be used with a comparatively large "window." To build such a core might appear to be quite a job at first, because if .014 silicon sheet were used and the laminations for a "C" type core cut from it to give a square cross section of 1⅛" x 1⅛", one would have to lay out and cut over 150 "L" shaped pieces, apply varnish, then stack the core inside the windings and bolt them together. Cutting all this material might make the job seem to be not worth the effort. A little research turned up information on standard cores which simplified the problem considerably. There is now available a line of standard tape wound cores of a superior magnetic material[2], which eliminates much of the work of transformer building and results in a better, more efficient job. The core selected for the transformer for an 813 has a core cross section of ¾" x 2" and window dimensions of 1⅜" x 3". These cores are split through the middle, windings may be made on a form and then assembled on the core. After assembly, the core is strapped with a steel strapping machine such as is used in many packaging operations and which should be available in almost every community. If a strapping machine is not available, it is a simple matter to make a strap of sheet metal, rivet angles to each end, and then bolt it together.

Having determined the core size, the number of primary turns were calculated, using a flux density of 94,000 lines per square inch and a space factor of 95% as specified by the core manufacturer. A greater flux density was used here to improve the regulation. Actually, the flux density could have been as high as 110,000 without danger of saturation. With a line voltage of 120, the primary should have 320 turns. Using the direct ratio in (3), the number of secondary turns was then found to be 26 turns.

The proper size of wire in power transformers is usually determined by using cross sectional areas of between 700 and 1,000 circular mills per amp. Since slightly over .5 ampere will be flowing in the primary, #20 wire was used. In the secondary, a #14 single glass covered formex wire was used. The heavier insulation was used to avoid the necessity of using fish paper between the layers of the winding, thereby decreasing the buildup and adding to the ease of winding. A double cotton covered enamel wire would probably do the job as well. Since 26 turns of #14 amounts to somewhat more than 30 feet of wire, a resistance drop must be allowed for and assuming regulation to be approximately 90%, the number of secondary turns was finally set at 28.

Construction

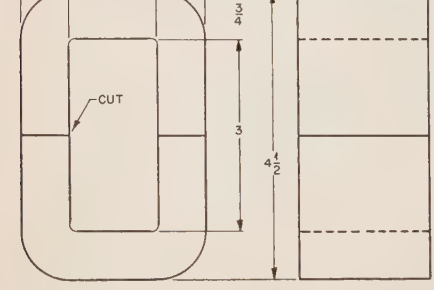
After collecting the materials, two wooden forms were fabricated for the primary and secondary. The primary form was made to the exact cross section of the core and the length of the winding was made 2". We secured a piece of 1/16" "Spauldite" laminated phenolic material and formed it to the primary form allowing 1/32" for the strap. Heavy fish



Completed transformer before application of varnish. The secondary is tied to the fibre tubing to prevent movement. Note isolation of the center tap (black insulation) from other turns by fish paper.

paper or fibre can also be used for this tube but provision for the strap and easy removal of the winding must be made. The phenolic material was chosen because it forms easily with the application of heat and resists deformation when the winding is done. A ¼" threaded rod was passed through and bolted to the form, then passed through a piece of 2 x 4 clamped in a vise, and the form was then turned with a wood brace. Between each primary layer a piece of .005" fish paper was laid.

After running a few capacity calculations, it was decided to space the secondary ½" from the primary. If the width of the winding is 1", the capacity should then be somewhere in the neighborhood of 10 $\mu\mu$fd. The inside dimensions of the secondary, allowing for primary buildup, should be 2½" x 4". The secondary form was made of a block 2½" x 4" x 3" and the corners rounded to a ¾" radius. The secondary was tapped at 14 turns.



Siler AA-19 Core used in building low Capacity transformer

After assembling the windings on the core, four pieces of laminated phenolic material ½" x 3/16" were cut 5" long, drilled and bolted together through the core with 3/16" brass rod. No drilling should be done on the core itself. Angles were used for feet and for holding the ¼" fibre tubes which support the secondary as shown in the illustration. It is better to use short screws threaded into the fibre rods instead of long screws or rods since heating will occur in every piece of steel in the magnetic field. Both the primary and secondary are tied with waxed twine to prevent displacement of turns during handling. After assembly, the entire unit was dipped in *Formvar* and baked at 275° for four hours. This will add strength to the secondary, make the whole unit stronger mechanically, and damp out 60-cycle hum. Shellac can be used in place of formvar with some sacrifice of mechanical strength. It is well to check voltage across the secondary and from each end of it to the center tap before finally wrapping it up to make certain no mistakes have been made in winding. The line voltage at this QTH is close to 120 so if yours is 115 or less, it might be necessa to refigure the number of turns in the windin

Testing

Results obtained from the unit were follows:

SECONDARY

I_s	E_s	EI	Regulatio
0	10.8		
4.9	10.2	49.98	94.4%
9.3	9.5	88.35	88%

PRIMARY

I_p	E_p	Efficienc
0.49	121	84.3%
0.88	121	83%

After checking the unit out with one 8 on the line, the regulation looked so good it w thought that perhaps it had been overdesigne so out of curiosity another 813 was add and the second group of figures was obtaine After running for over an hour under this loa the primary started to get hot and although t secondary probably would take this load b cause of the high quality formex and glass i sulation, it is considered that eventual brea down of the primary insulation might occur the high temperature was sustained for a length of time. It is possible, however, that t windings can be redesigned, the flux densi increased, and the same core might be used a transformer designed to supply two tube The capacity was checked on a bridge and w found to be about 4 $\mu\mu$fd. This figure is low than the design figure and the difference w attributed to the fact that the winding w slightly narrower than 1" and the spacing w increased since the primary buildup was a litt less than anticipated.

After completion, the cost was figured a it came to slightly less than the cost of a co ventional type filament transformer deliverin the same power. Voltage breakdown is high than we could possibly measure and the eff ciency compares favorably with the advertise efficiency of low capacity transformers use for antenna lighting systems (89%). All in a the project is well worthwhile since only abou two hours is required to put the whole thin together after all of the problems have bee worked out.

Like everything else, if you want your cak you can't eat it and in this type of transforme the sacrifice is in its size. The unit takes up space of 4½" x 5" x 5". This seems big an looks bigger, but when one considers that i a GG final there are no bias and screen sup plies you are still ahead costwise and spacewise

1. *Radiotron Designers Handbook*
2. *Arnold Engineering Company*, 3450 Wilshire Boulevard, Los Angeles 5, California, and 350 Fifth Avenue New York City, New York

Designed to help blind hams tune their rigs, here is an easy to build gadget that can be used by anyone to simplify transmitter tuneup.

R. W. Jones, W6EDG
735 Donax Ave.,
Palm City, California

An Audible Field Strength Meter

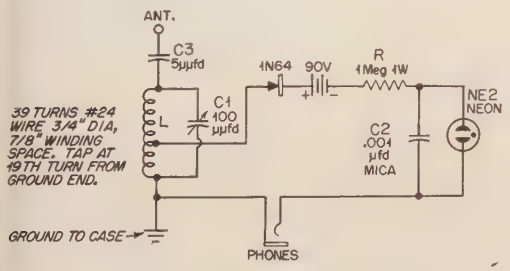
Blind hams have a handicap that few of us can appreciate: they can not read meters.

During a visit to the shack of KN6MTN I noticed that the tuning controls were taped down with Scotch tape. Phil told me that he asked friends to tune his transmitter and then taped the dials in position. It was not a good method, in my opinion, because of possible changes in loading with rain, vibration or other factors. Indeed, a quick check of tuning disclosed that his transmitter was not properly "dipped", and Phil had been operating with the transmitter functioning at much less than peak output.

Later I talked it over with W6OQY and we decided to build Phil some type of tuning instrument. A check through my old *CQ's* brought up an issue I remembered seeing several years ago, and I reread the article on W9WEU's "Oscar".[1]

The "Oscar", however, was a milliammeter and I felt that Phil could do better with something that would give him an indication of maximum output—and permit him to tune both the transmitter and the antenna tuner. What was needed was a field strength meter that could be operated *sans video*.

We first thought of a conventional field strength meter with the glass removed from the meter so the operator could feel the needle, "reading" the values on raised marks similar to those on Phil's special wrist watch. Good idea?—well, the first model was a failure. I tried tuning my own transmitter while feeling the meter, with my eyes shut. I could feel the meter needle and I could tell how far up scale it moved, but it still didn't seem right. The instrument was too fragile, and it was hard to detect small changes in meter readings. It didn't seem to be the best approach, or even a good one.



Schematic for the "blind" FS Meter

One of Phil's remarks lead us into building the meter that really worked. He simply mentioned that he could hear tires singing on pavement before he could hear the engine of an approaching automobile. We wanted some type of audio unit.

The Circuit

The final design is shown in *Fig. 1*. A small neon bulb relaxation oscillator supplies an audio tone to the headphones. The tone is the indicating medium: A dip in the tone's frequency indicates some r.f. has been picked up and rectified by the instrument. The greater the amount of r.f., the lower the tone. The r.f. for the tuned circuit of *L* and *C1* is picked up with a small antenna and coupled to the tuned circuit through capacitor *C3*.

Philip Leonard, KN6MTN, tunes his field strength meter to resonance.

The return circuit for the relaxation oscillator is back through the crystal diode and through half the tuned circuit. This is one case where a crystal diode does a job that a vacuum tube could not do. The back resistance of a crystal diode is not infinitely high as in a good vacuum tube, and that back resistance (measured at 65,000 ohms in this 1N64) allowed the current to flow and make this little gem possible. The forward resistance of the diode was measured at 50 ohms.

1. *CQ*, July 1948, Page 22: *Oscar*, A Milliammeter for the Sightless Amateur, by H. S. Brier W9EGQ and V. O. Christian W9WEU

FS Meter, cover removed

The basic circuit is simple: a relaxation oscillator operating from the B battery with the crystal diode rectifying r.f. from the tuned circuit and applying a d.c. bucking voltage in series with the relaxation oscillator. The stronger the signal picked up by the field strength meter's antenna, the greater the bucking voltage and the lower the tone. The circuit was tried with aiding voltages, giving a rise in the audio tone when a signal was tuned in, but my ear—and Phil's too—seemed to respond better to a decrease or dip in the tone.

In practical use the signal is first tuned in on the field-strength meter. There will be a sharp dip in the audio tone's frequency as *C1* is tuned through resonance. With *C1* left tuned to resonance, the transmitter controls are adjusted for lowest tone in the phones. The instrument is very sensitive and will allow critical adjustment of the transmitter's output stage and antenna tuning network.

This model tunes only 40 and 80 Meters. A band-switching model could easily be built, and one will be built here when Phil graduates from the Novice ranks and wants to work other bands.

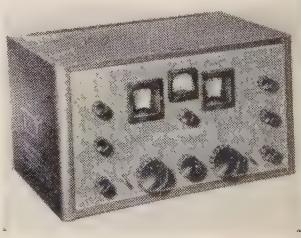
Pickup Antenna

The gadget must have a pickup antenna. KN6MTN uses a fifteen foot piece of wire around the molding of the room. Too much antenna will cause the relaxation oscillator to stop due to excessive bucking voltage. Too little antenna will result in not enough change in the indicating tone. The pickup antenna must be adjusted to suit the field strength of the transmitter. It should be in the field of the transmitting antenna and removed from r.f. fields present in the transmitter.

I believe this type instrument could be used on a multi-stage set up. If the blind operator has all the settings for each band for a transmitter such as a *Ranger* or a *DX-100*, then uses this device to peak each of the controls while listening to the output, he could easily tune such a transmitter. Another possibility would be to install output jacks connected to small probes near each stage's tuned circuit. This would enable the operator to plug into the transmitter stages progressively and tune each to resonance, and—if necessary—choose the proper doubling frequency. For such use a band-switching field strength meter could be built with raised marking for each band.

This unit, used in conjunction with W9WEU's audio milliammeter, could give the blind ham almost complete tuning facilities. Including that very important check on the amount of radiated output. ■

Hammarlund HQ-140-XA



"Now, that's the good old HQ-140-X. What's it doing there?" Look closely and you'll find that this improved model of the 140 is designated the HQ-140-XA. A tough receiver to improve on, but Hammarlund claims they strained to the utmost and came up with a few refinements which will make it worth your while to hie thee on down to the local Electron-Handlers Shoppe for a closer examination. The XA is highly sensitive and has a ruggedized but smooth-operating tuning dail which permits extremely accurate logging. But don't let all this produce a sensation of uneasiness in the region of your negotiable assets. The HQ-140-XA, "Although incorporating extremely marked advances" over the 140-X, can still be bought for money. Why not get the dope from Hammarlund Mfg. Co., 460 West 34 St., New York, N. Y.

New National Dial Illuminator

Recognize this? It's the backside of the famous National Type MCN Dial, with something added: a slick little dial lamp that rides along with the dial pointer, just behind the translucent dial. Dubbed the "Blue Chip" (don't ask me why) Dial Illuminator Kit, this bit of hardware comes complete with a #51 panel light for 6-volt operation, hooks up in instants (of course, if you want it to show through the other side, you'll have to make a 2" x 3½" rectangular cut-out in the panel behind the dial face). You'll want to leave the overhead lights off in your shack, just to show off this *chic* accoutrement. Probably pay for itself in the first month, n'est ce pas? Made by National Co., Inc., 61 Sherman St., Malden 48, Mass.

Expedition To Whiteface

Helen Harris, W1HOY
P.O. Box 2502, Medfield, Mass.

An expedition had been planned. (These words should go on my gravestone as an epitaph.) This time we made a few preparations in advance by writing the Chamber of Commerce in Saranac Lake, New York, and asking which was the highest peak of the Adirondack range and whether we might obtain permission to set up our radio gear at that point. By return mail we received the information that Mt. Marcy was the highest peak, but they didn't think we would wish to use that spot as we would have to carry all of our radio gear on our backs over a very narrow and dangerous trail for a distance of something over a mile. They suggested that we might like to use the top of Mt. Whiteface which had a road to the peak and thus would be much better for setting up our gear.

After exchanging endless letters, we finally received a telegram giving us full permission to use the Mt. Whiteface peak and telling us with whom to get in touch when we arrived in the city of Saranac Lake. We were all packed ready to leave and were just waiting for the final word. We had figured on leaving the following morning at crack of dawn, however, by crack of dawn we were practically at our destination. As usual the O.M. just couldn't hold out until daylight, so at midnight I roused the children from their beds, packed them together with their blankets in the car, picked up the dog and away we went.

We were no more than fifteen miles from home when we got a flat tire on the trailer that was carrying the radio gear. Sam changed the tire in the dark and from then on we had our fingers crossed 'cause that wasn't the tire we had expected to go.

With two hungry kids, two greedy adults and a dog who ate everything in sight we decided that if we wanted to get anywhere and home again we'd have to economize while on the trip. We did our own cooking. (We still can't look Cheerios and frankfurters in the face.)

When we arrived in Saranac Lake we went to the Chamber of Commerce. The pair of gentlemen waiting to greet us gave one look and weren't so sure that they wanted us on their mountain-top. However, since the children looked well-fed and the dog didn't look abused they probably decided we couldn't be quite as tough as we looked. We were given a letter of introduction to the ranger who was stationed at the fire tower on the mountain, directions on how to get there and a key to the toll-gate at the foot of the mountain.

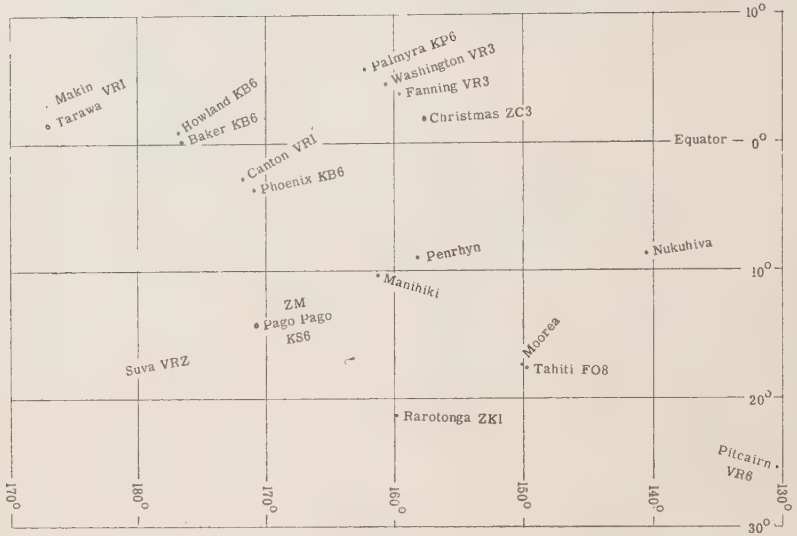
We had just reached the camping grounds and were wrestling with the tent (borrowed), when a gentleman in uniform came over and lent us a hand in setting up the camping equipment. He introduced himself as Hiram Denton, a Forest Ranger. I have never met such accommodating people as the Rangers. We've met them on several occasions and they always put themselves out considerably to help.

Hi, as we were soon calling him, took the children under his wing and explained to them about camping in the mountains. He promised that he would take them to his lean-to up the mountain and show them some of the wild animals that came to visit him. He insisted on going up the mountain with us that same day to point out different views from the top and help Sam set up his equipment. To our great joy, he suggested that Sam use the fire-tower and the power-lines which were running to the tower. This idea saved lots of work and the noise of the generator.

After the gear had been set in place Hi suggested that he show us his lean-to which

[*Continued on page 92*]

Yasme -



– Tahiti to Canton Island

All good things in life somehow come to an end. So there I was preparing to leave Tahiti after one of the most enjoyable stays of my whole trip.

Most of you know what it's like to leave true friends behind. In my short stay I had made many, and leaving them is one of the unhappy things that I have to contend with on a voyage such as mine. I must admit that it is always the departure from a place where I have been made welcome and given every opportunity to have a good time that is the toughest part.

The hazards of the sea are many, and can inevitably be handled either by brains or brawn; parting is a trouble of the heart. Oh, let's not get all sentimental, I ain't built that way.

Needless to say, all the assistance I required to put the Yasme in trim was readily volunteered by my many friends. During the last week prior to departure, the Yasme was a hive of activity whilst everyone did what they could to assist in those many tiny jobs that take so much time. I will not discuss the thousands of odd jobs that are essential to fit a small boat in readiness for sea, but one needs every bit of assistance that can be obtained, and here that presented no problem.

Numerous invitations came for last suppers and dinners, etc., but time was moving along too fast to accept them all. Finally I went to my old friends' place out in the country for a real Tahitian dinner with dancing and singing afterwards for some hours. Food and wine were there in plenty, but 'though I took my fill of the grub, I had learned my lesson regarding the Tahitian beer, and I left it strictly alone . . . having no intention of finding myself with a hangover the following morning. The party packed in around midnight, mainly at my request, and I wended my way back to the old Yasme for my last night aboard in Papeete.

At 0700 local time around twenty of my friends arrived laden with bananas, grapefruit, pineapples and other local fruits. I feel very sure I had sufficient fruit there to supply a crew of ten men, still with a surplus. Where to stow it all was quite a problem, but finally it got piled in the main saloon, all over the floor and on the bunks, to be moved later. Where, I just didn't know or care about at the moment . . . It became impossible to move in that cabin, but since all the work was on deck, no inconvenience was caused.

Hauling Anchor

Hauling up the anchor was quite a problem, though manpower was available in plenty. One doesn't haul up sixty fathoms of chain and a heavy anchor that has been embedded in coral and mud for three months without some sort of bother. These Tahitian lads are pretty tough, but it took us all of an hour to get that chain and anchor aboard. It was a real mess, having developed a variety of marine life on its entire length, and Oh brother did it hum. There was no time to clean it and remove all the seaweed, so it had to be stowed in the chain locker as it was, and it was well over two weeks before the smell finally subsided sufficiently for me to go into the cabin without almost passing out.

Somehow or another, departure time was delayed owing to the usual unforeseen circumstances, and I decided to wait till after lunch time to buzz off. This decision was favorable to everyone there, so we all trouped off in a large bunch to the local cafe for chow. Back to the boat, and by this time, the crowd had materially increased, everyone came up putting garlands of flowers around my neck and crowns of flowers on my head until I looked like a walking flower show. With the arrival of others came more gifts of fruit until the decks of the Yasme were covered. I could hardly walk from one end of the deck to the other without falling over a stem of bananas. Everyone was talking at once in Tahitian and trying to move around on the Yasme, so you have a good idea of the chaos aboard.

Time was passing so I cast off the lines holding Yasme to another yacht, and with my crowd of friends aboard I cruised around in tight circles until, out of the distance, the pilot boat came steaming up with my good friend the Port Captain aboard.

No Dry Eyes

Well, this was it . . . all my friends very reluctantly clambored aboard the pilot boat, and there was I standing despondently in the cockpit. There wasn't a dry eye among us, and that means me too. Then, very slowly, the pilot boat pulled ahead and guided me through the pass of Papeete, and, the old Yasme chugged along feeling, I am very sure, as unhappy as I. We passed through that reef infested water out into the open sea . . . whether to return or not, who knows?

My garlands I threw over the side in the custom of the Island, but whether they floated back to shore again to signify my return I shall never know. In my heart I know I will return again some day.

Once clear of all dangers and with ample sea room, up went my very poor excuses for sails. For three weeks prior to departure I had

Final inspection of the Yasme before departure from Tahiti

worked solidly on them to make them look like sails, but as I hoisted #1 jib it ripped right across, even though the breeze was light. The mainsail managed to creep its forlorn way up the mast until it reached the top, and although it got there without incident, I could see that given the slightest provocation, it would collapse. The thing was to prevent its flapping too much. I knew whilst the wind remained steady it would hold out and at that time the wind, what there was of it, was steady. But there was a bad swell on, the aftermath of a recent cyclone in the Fiji area.

Swell Time to Go

Hardly a day to start a voyage. Quite frankly, I should have known better than to leave directly after a cyclone . . . there is always a lack of wind, and also a big swell, but then I wasn't to know that when I had originally planned my date of departure . . . I was to regret later my decision to leave on sked. There we were, the Yasme and I, on our way with plenty of pleasant memories of the past, nevertheless in a crestfallen mood.

Trimming the sails to get the Yasme to sail herself is always a lousy job at the start of a voyage and it invariably takes a couple of hours to get her balanced just right. This just wasn't my day. I tried everything I knew, but the wind fluctuated so much she just wouldn't stay on course more than a few minutes at a time. Finally the wind gave up the ghost altogether and we were without anything to steady us. This set us into a 45° roll, which threw the fruit in the cabin all over the place, and tossed innumerable bits of gear around the ship into inaccessible places, not to be found again for many moons . . . good job I had my wooden leg screwed on and glass eye in place at the time.

I finally stuck the iron horse on . . . engine, to you, and soon we were chuffing along on the usual three cylinders . . . three bangs and a pop; around three knots; hardly pleasant, bu at least it cut down that roll and moved u along in the right direction.

Nightfall came. There was a deathly silenc except for the infernal clatter from the engine and astern, in the distance, the lights of Papeet shone out as though to give me a last farewell The sky was brilliant with the myriads of star and the moon, just risen, made a silvery glow over the whole sea . . . all I needed was breeze, and then we should have perfect sailin conditions . . . but that wasn't to be. Sleep an I didn't keep company that night. My intitia tion back to the ocean, the awful smell from the rotten seaweed on the anchor chain, th heat from the engine and my utter misery a leaving my friends were hardly conducive t sleep, so I just sat there in the cockpit with the tiller in my hand, being sprayed with ar oily mist from the exhaust of Yasme.

I kept looking astern, even though I realized it was only making me feel more despondent The urge was strong and it was a very unhappy Danny that sat there around midnight with his thoughts, gazing at the very faint outline o that wonderful fantastic place Tahiti with al of its charm and gayety. How I wished a that time the mast would snap or something would happen to necessitate my return, but no apart from the lack of wind, everything wen fine, and I could find no logical excuse to return.

That night nothing was done at all barring steering the boat. No skeds, no cooking, in fact no nothing, and I think you can all understand why.

Daybreak brought a slight breeze, and also a hunger too, but first, get the . . . I nearly called them sails . . . up. This time they actually went up without ripping, and with the engine now silent we cruised along at a steady four knots. We were in silence except for that eternal swish of the bow wave and the faint hum of the propeller freewheeling.

To prepare food in the cabin was out of the question due to the awful stench, so I tore into the load of fruit and drank dozens of cups of coffee to brighten up the old head. Checked sked book, but nothing until 0230 GMT with Dick KV4AA, then Joe FO8AB, Jock ZL2GX, and finally Wowie KB6BA on Canton Island. It was a long time for me to wait to pour out my troubles and cry on someone's shoulder. There was no point in firing up the rig as the band was dead. So I just sat there doing nothing and making myself feel worse than ever . . . how can a guy get like that? Oh well, I realized that it would all wear off in the end, but it was hell waiting for that time to elapse and the weather conditions did not give me any opportunity to do anything else except just sit and think of Tahiti . . . in any case, it made me feel better to feel miserable, so what the heck.

I made some semblance of order in the cabin. In other words I picked up everything

Danny manages a wan smile before tearing himself away from Tahiti

that happened to be in the way and slung it into a heap on one side of the cabin, thereby leaving one side clear and the other a mixture of fruit, books, radio gear, clothing, and a load of wire that that had come unwound from its coil. A tangled mess, but I couldn't have cared less.

Getting back to sea routine again presented no problem and the entire crew remained free from seasickness, regardless of the aroma below and the rolling of the boat . . . all we had to do now was to get the old brain clear and endeavor to forget the past. At long last it was time to fire up the rig and sked Dick. Oh boy! someone to talk to, even though it was only cw . . . that rig certainly takes the solitude out of this deal.

Skeds

The *Onan* started without a protest, and right on time Dick came blasting through on frequency with his Viking KW. Just to hear his signal with that certain touch that no other ham seems to possess pushed up my morale 100%. All my troubles seemed to disappear in a few seconds. I think Dick must have known how I felt, as he broke one of his hard and fast rules and came on fone for me. Perhaps you don't realize what it's like to hear a friend's voice under my circumstances, but I can assure you, it was worth a million bucks. That QSO was the beginning of the end of my gloom period, and shortly afterwards the wind came up, the sails stopped ripping, and even the seaweed stopped making the boat smell like a garbage heap. The Yasme seemed to cheer up too, and before very long I started singing, which although it makes me feel good, certainly annoys the birds and keeps the sharks at a respectable distance. Whilst in this mood I got the whole stack of grub organized, then sat back and waited for my next sked to turn up with Joe. Late as usual . . . Tahitian style, Joe came on, off frequency too, but he was there . . . good old Joe, one of my best friends. When it came my turn to return to his report, my throat became paralyzed, a lump seemed to be blocking my voice altogether, and when he told me my girl friend was there in the shack it was quite a few minutes before I could get out what I wanted to say.

Darn it all, as much as I got a kick out of hearing their voices, it knocked me right back into the depths of despondency again. It was sure good to hear those voices again and I wouldn't have exchanged that QSO for anything in the world. Joe's final or *bon soir* and *bon voyage* and the promise to QSO again later put me back on top of the world and then I just sat back and waited for Jock to come on.

Right on frequency he was with a 15 db over 9 signal as per usual. His cheery voice, which is known to so many of you, also helped to kill the gloom. What a variety of sensations I was experiencing that day. To hear his infectious laugh, his always cheerful voice, and that typical "By Golly" expression; how could anyone remain unhappy? Very soon I was laughing with him, I must admit he certainly knows how to bring a body out of the depths of despair . . . how I enjoy my QSO's with Jock.

Straight after Jock's final, Howie came through on CW from Canton Island. Conditions being OK, we went on fone, but oh the QRM! I must have knocked years out of his VFO in getting him to shift frequncy every few minutes.

These four skeds were kept every day, and while I would have loved to continue transmitting all the time, as I did in the crossing

from Panama, my gas was strictly limited, and weather conditions were hardly suitable to spending hours on the rig.

Becalmed

Two days out and Moorea still in sight! The wind, which up to now had been variable, dropped altogether and there we were, stationary, with hardly a ripple on the water. It seemed sacrilege to destroy the complete silence and gentle sway of the Yasme with the clatter and heat of the engine, but hanging around in that spot wasn't getting us anywhere. All the time there was a terrific westerly set of the current pushing me off course, so I had no alternative but to start up the engine again.

That calm seemed to last for ever . . . never a semblance of a breeze, and that poor little engine ran continuously for four days, gradually getting hotter and hotter, and running increasingly more erratic. I didn't dare stop it, even to top up with oil, as I knew it would never start again. We had left Tahiti with only three cylinders operating and as time went on it was barely firing on one, but still using the same amount of gas as for four. My gas supply was getting dangerously low, and what with the engine in that state and no wind, you will have some idea of the spot I was in.

I began to wonder whether it would be better to return to Tahiti for more gas or carry on in the hope that some wind would ultimately rise.

On sked that day with Dick I discussed the whole thing, but no solution was arrived at. Later, when I had sked with Jock, ZK1BS broke in and informed me that he had heard of my difficulty and that the local government in Rarotonga had arranged right away to have a drum of gas shipped from Manihiki to Penrhyn atoll, which was around the half way mark for me. This news cheered me considerably. Later, Joe told me that there was no more gas available in Tahiti. I had by that time reached the point where, to return to Tahiti would have been just as difficult as going ahead to Canton.

Now before we go any further I want all you landlubbers to understand the general situation: There was a strong current setting the Yasme to the West at a rate of about 25 miles per day. Without wind or engine Canton Island would be impossible to reach, so it wasn't a question of just stooging around the joint amusing the sharks and sunbathing until a wind came up. I had to keep moving else Canton Island wouldn't be seeing me that year.

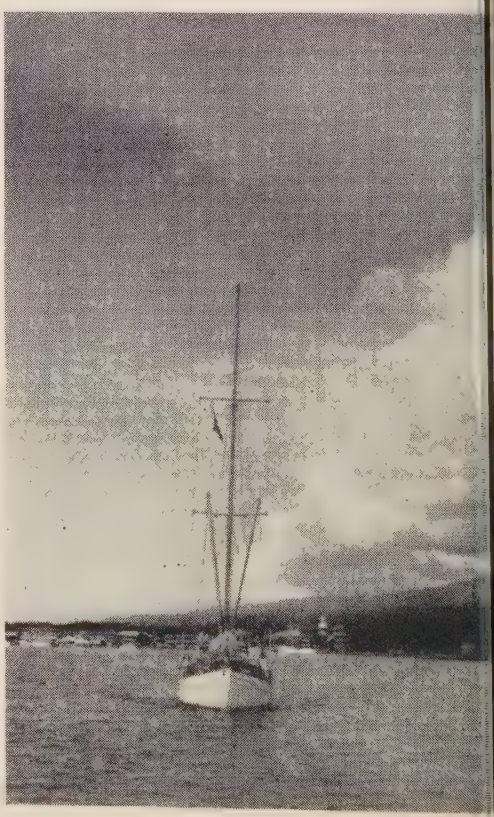
Now Penrhyn Island was considerably north of my actual course, and as time went by I realized that, even knowing the gas was there, with the tiny amount of power I had available and no wind, it would be impossible to make. A QSO with ZK1BS informed me that the gas had originally been at Manihiki, which was right smack on my course, and had been taken from there to Penrhyn since they though was going to call there. Now there wasn't gas left at Manihiki, what a joke!

Yes, it was a great big joke, but I wa laughing. I checked on my gas supply found I could cover around 400 miles with engine running at its normal efficiency . that is, on three cylinders with the fourth pis being pushed along by the others.

I realized then there was but one alternati to strip the engine down completely and do best to get it running better. Many of you lows sitting back in your overstuffed armch with a miniature workshop in the garage every facility available when you turn arou may say, "Why, that's no problem" . . . you just don't *know*. You haven't seen the stallation of Yasme's engine, which althou nicely situated for normal maintenance minor repairs (if you don't mind getting y arm burnt now and again) is far from be nicely organized for the major work whic was contemplating.

Engineering Officer

Now I won't go into all the gory details s as barked knuckles, odd fingers lost here there, etc. Removing the cylinder head wi out damaging the gasket, getting valve spri compressed without a special tool to do job in a boiling hot cabin with the ship roll



ll over the show was far from being a simple natter. Every time I put a spanner, an engine part or a nut down, although it would only be eft for a couple of seconds, you could bet your bottom dollar that when I went to pick it up, there it was . . . *gone*. In one particular instance which is still vivid in my mind, a special nut ropped into the bilge. This meant lying full ength in the saloon, getting my arm worked n between water pipes, wiring and many projecting parts of the engine to reach that hole alled the bilge. This struggle took maybe 15 ninutes, and my arm seemed to lose itself n the maze of pipes and what have you. inally, my hand reached a soft greasy mess . . I'd struck oil . . . that meant I had now ound the surface of the bilge water. Now to et to the bottom of it. With my arm stretched o its fullest extent I still had a long way to go. omehow or another I managed to squeeze my houlder down into the hole and fumble around n this glutinous mess. I encountered something lse. Wondering what I had discovered I slid ny shoulder and arm out gingerly, ripping off bout three layers of skin, and found a spoon had lost about a month ago.

Well, after counting ten, I made the big ive again. It was a little easier this time since he entire upper portion of my body had a layer f black oil on it and my arm sort of oozed round all the corners. In my travels around he bilge I discovered three pencils, one eraser, fork, a comb without any teeth, one fish hook, very defunct spud, but *no nut*.

By this time, my temper was getting just a ttle frayed. I considered removing the entire ngine to find the nut, but after considering little further thought that maybe it would be easier to look in the junk box for another. Naturally I found every type of nut, bolt, and washer except the right one. Finally I decided that when the time came to replace the nut I would just ignore the fact that it was missing. Perhaps the engine would go better, who knows.

By then every possible part of the galley, cockpit and myself, had become coated with this black gooey substance. It didn't look too good, but then it's good for the wood and will keep the termites out . . . it's nice to think that, but underneath those thoughts were others which told me that the whole darn mess had to be cleaned up.

Time was creeping on. I had started this project around 6 a.m., and with the arrival of dusk I was working in semi darkness (the batteries were down). That didn't really matter since I didn't know what the heck I was doing. If a piston happened to get put in upside down the engine would run backwards . . . maybe, and I could just turn the boat around and we could go . . . coming, if you get what I mean.

Later, much later

Well, to make a long story longer, I did by sheer luck finally get the engine together around three the following morning. Apart from a big end bearing and two piston rings I had nothing left over and the engine looked exactly the same as when I'd started. I couldn't find where to put bearing and piston rings, so, since I had noticed earlier that there was quite a lot of space under the inspection cover of the gear box I unscrewed that and dropped the odd pieces inside . . . out of sight, out of mind.

Now, the big moment had arrived. Everything seemed OK so I took a deep breath and pressed the starter button. I pressed the button again, and kept on pressing until I nearly pushed the button through the panel. Apart from a dismal moan from the starter and a horrible death rattle from the solenoid there was not a bleat from the engine. It then penetrated this befuddled brain of mine that maybe the batteries were too weak to push the engine over. Considering the amount of power the engine gave me an ordinary flashlight battery should have spun the starter like a top, but there I was, with a completely assembled engine just bursting to send its deep throated roar into the silence of the night, and not a whistle in the batteries.

This famous engine of mine cannot be hand started like a normal one, so that meant I would have to charge the batteries from the auxiliary charging plant. I have had this plant ever since it graduated from being a motorcycle engine and a car generator and it has always started without a murmur. This time it joined the general engine strike and although I pulled that starter cord until I wore out my arm, it just wouldn't have it. On one pull the

[*Continued on page 98*]

South Sandwi
Islan

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Buenos Aires, Argentina

In the interests of DX'ing the *Radio Club Argentino* gets together a DXpedition every year to visit one of the Argentine zones in Antarctica. These trips furnish information for people who might plan to stay all year round in these remote spots, and provide useful data on propagation conditions from these areas and the ability of radio equipment to stand up under difficult conditions.

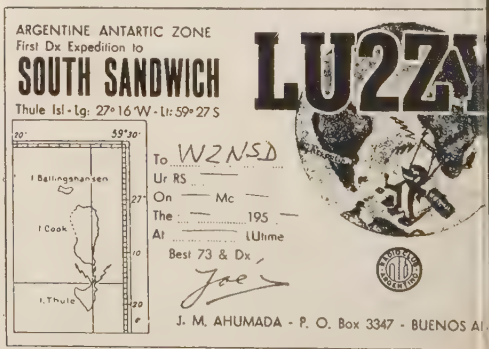
Since there was already some permanent radio operation from the Antarctic continent, South Shetland and the South Orkneys, it was decided to put the South Sandwich Islands on the radio map for the first time. Questions arose as to landing on the islands since they have seldom been visited by anyone, reportedly being surrounded by rocks and thus almost inaccessible. All these worries were dispelled, plus the problem of how to finance such a journey, by the Argentine Navy.

On November 23rd, 1955 we sailed on board the icebreaker ARA San Martin. We stopped off at Antarctica, the South Shetland and South Orkney Islands and made a few tacts from each of these stops. Finally w rived at the South Sandwiches.

We got the radio equipment, fuel and plies ashore in a small boat, just narrowly ing several jagged rocks in the plunging The South Sandwiches now had a popula of three, all hams, no doubt the highest con tration of hams ever to constitute the po tion of an entire country. The three o were Lt. Dick Hermelo LU4ZY, Mike V fane LU3ZY, and myself LU2ZY (each c had our own private call area).

The ice breaker left for other duties a set up our radio equipment. Before long were on the air and had contacted ZP5 LU9AX, LU9DBI, CE3BM, CE3 LU4DMG, LU9AAX, CE3JJ, LU4 ZS1BK, ZS2ND, W1FH, ZS6AJW, CX2CO. We set up the tents, got out the s ing bags (goose feathers), and made read take down meteorological data. We wo in shifts, exploring the island, observing animals and birds who make their home t and making as many contacts as possible.

Our precise location was latitude 59° south and longitude 27° 16′ west on T Island, the most southerly of the group. island was roughly pear shaped with a pla about one half mile by one mile at the p We set up our camp on this plateau. Be us was a mile-high mountain with an enorm



DX Expedition:

LU2ZY

lacier which emitted grumbling noises con-nuously as it slowly melted in this thawing eason. The cold was intense, but it was the ind that was the real villain and quite a dan-er to the antennas. Gusts of over 110 mph ere measured. While in QSO with PY2CK ur tents blew away and left us with one provi-on hut for our beds, kitchen and radio shack.

Our equipment consisted of a Collins 75A2 nd 32V2 plus an SX71. We used a beam for 0 Meters and a long wire for the other bands. ll told we made 1664 QSO's, with 45 being n 40 Meters, 1455 on 20, 90 on 15, and 74 on 0 Meters. Ten and Fifteen were very erratic nd the only dependable band turned out to be wenty Meters. Few South Pacific and Euro-ean stations were heard, but America and frica came in well. Perhaps you would be nterested in a few more statistics:

First stations on each continent: W1FH, P5AY, VS6CG, GM3DHD, ZL2GX, and S1BK.

771 W's were contacted, of which nearly 0% were W6's. 140 of these were phone SO's 631 cw.

With amateurs from all over the world as ur company, we never felt alone. The lo-al population consisted primarily of about 300,000 penguins. These birds made a constant noise muttering to themselves. Now and then one would wander into the shack, listen to the noises from the receiver, and walk away shaking his head. Between snowstorms we managed to shoot a few seals, one of which turned out to be a Furrier Seal, thought to be extinct in the last century.

Just as we were really getting started towards our Worked All Amateurs certificate things started to happen. The islands were volcanic in origin and we had smelled the sulfurous gasses from time to time, but we didn't expect anything serious to turn up. All of a sudden our island started shaking and jumping and a neighboring island exploded with very high jets of incandescent lava coming from several mouths and falling into the sea with a great hissing, crashing sound and forming huge pink clouds. We waited no longer. With the penguins and seals leaving for safer waters, we sent out a hurried SOS which brought the Navy into ac-

[*Continued on page 98*]

Transistor Circuitry

by H. F. Priebe, Jr. W2
192 Mills St.
Morristown, N.J.

The recent appearance of the transistor on the electronic scene has created a great amount of enthusiasm throughout the electronic industry. Examining a list of some of the transistor's unique characteristics will show why this intense interest exists. The transistor is rugged, small in size, instant operating and efficient. These features lead us to believe that among its many applications it has significant importance in miniature, portable electronic equipment such as receivers and transmitters.

The radio experimenter and radio enthusiast have been exposed to a wide variety of transistor information. Although a sufficient amount of transistor circuit information has been comprehensive, it has lacked a simple language approach. The transistor gadget type of circuitry has been very interesting but has omitted a lot of do's and don'ts about the transistor. It is hoped the material presented here will enable the radio enthusiast or experimenter to get "feel" of transistor circuitry in the fewest simplest words.

Two Types

Often in articles about transistors both point-contact transistor and the junction t sistor have been discussed in the same text. two types of transistors are quite different. junction transistor has better stability, m gain, better efficiency and a better noise fig The junction transistor is by far the most po lar to date. Consequently, the presentation will deal with junction transistors only when a transistor is mentioned it is a junc transistor.

The tendency, in many transistor artic has been to use vacuum tube analogies to across transistor circuitry. These analogies

MFG.	TYPE	MAXIMUM RATINGS				AVERAGE CHARACTERISTICS (AT 25°C)									
		COLLECTOR VOLTAGE VOLTS	COLLECTOR CURRENT MA	COLLECTOR DISSIPATION AT 25° C	AMBIENT TEMPERATURE C°	COLLECTOR VOLTAGE VOLTS	EMITTER CURRENT MA	COLLECTOR RESISTANCE (MINIMUM) MEGOHMS	BASE RESISTANCE OHMS	EMITTER RESISTANCE OHMS	CURRENT AMPLIFICATION FACTOR (MINIMUM)	COLLECTOR CUTOFF CURRENT (MAXIMUM) μA	COLLECTOR CAPACITANCE μμF	NOISE FACTOR DB	FREQUENCY CUTOFF MC
TEXAS INSTRUMENTS INCORPORATED	200	30	5	50	50	5	-1	.4	150	22	9	10	15	26	.9
	201	30	5	50	50	5	-1	.4	170	22	19	10	17	23	1.1
	202	30	5	50	50	5	-1	.4	200	35	49	10	19	20	1.3
HYDRO-AIRE	CQ-1	-40	-10	150	50	-6	1.0	.5	200	30	.9	20		33	.5
RAYTHEON	CK721	-22	10	33	50	-6	1.0	2.0	700	25	45	6		22	
	CK722	-22	10	33	50	-6	1.0	2.0	250	25	12	6		30	
	CK723	-22	10	33	50	-6	1.0	2.0	350	25	22	6		25	
RADIO RECEPTOR	RR-88	-50													
											EITHER α OR β	I_{co}			

Fig. 1

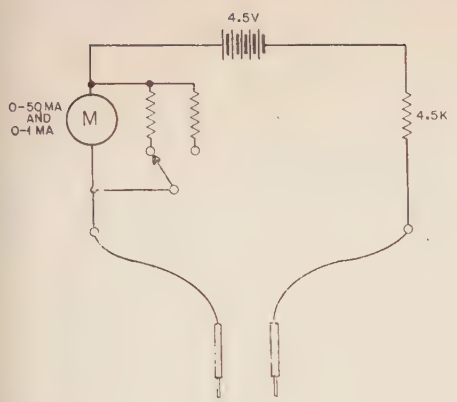


Fig. 2

not necessary. To be perfectly fair for every similarity to vacuum tubes that would be cited it would require mentioning the exceptions as well as the dissimilarities. The presentation here describes the transistor in its own terms, those of a semiconductor and no analogy to the vacuum tube will be made.

If you are not one of the venturesome individuals that has purchased a transistor (remember

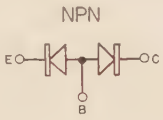
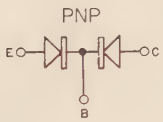


Fig. 3



now it is a junction transistor) at least make believe that you have and follow us through the steps as we acquaint ourselves with some of the transistor's important characteristics. *Figure 1* is a list of some of the available transistors and their maximum ratings and average characteristics.

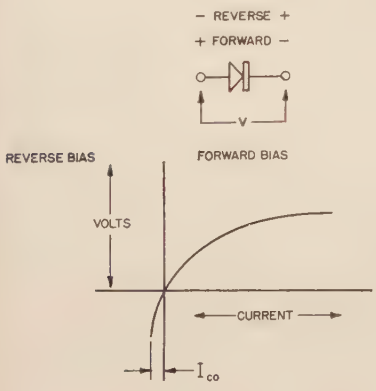


Fig. 4

Test Circuit

A few simple dc measurements will tell us enough about the transistor to explain its operation in dc and low frequency (audio range) circuits. To make these tests a set-up like the one shown in *Figure 2* is used. It is important that a high impedance source (constant current) be used for these measurements rather than a voltage source (battery directly). This can more readily be appreciated when the characteristics of transistors are explained. Briefly, the transistor is essentially a current device; if we were to use a constant voltage source directly, for measuring the currents they would be limited only by the resistance of the tran-

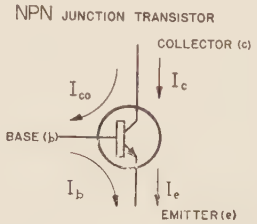


Fig. 5

sistor and this could be disastrous, for the transistor. Thus a simple d.c. test-set to provide a constant current for low impedances is made of the following components: A 4.5 volt battery, a 4.5 K ohm resistor and a combination micro-milliampere meter (O-50 or 0-100 μa and 0-1 ma) all connected in series with the test leads as shown in *Figure 2*. The current and voltage at the two terminals of our test-set are: At low impedance, a maximum current of 1 milliampere is available (low voltage

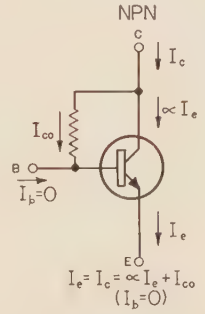


Fig. 6

of course) and with low currents (where the I-R drop across the 4.5 K resistor is negligible) nearly 4.5 volts is available.

Using the test set-up shown in *Figure 2*, we measure between the base and either of the other two terminals (emitter or collector) of the transistor. We find that the properties exhibited are exactly the same as if we were measuring a semi-conductor diode, say a 1N34 or similar, with which we are all familiar. This is true for both PNP and NPN types, the difference between the two is that they exhibit exactly opposite reactions when the same polar-

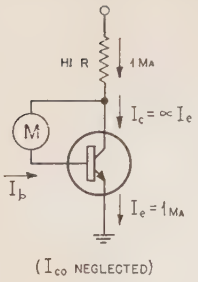


Fig. 7

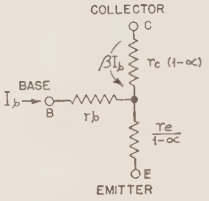


Fig. 8

ity from our test-set is used. Amplifying the above statement a bit—when the polarity applied from our test-set is positive on the base and negative on either the collector or the emitter of an NPN transistor we notice that the current is near maximum or 1 ma. in our case. This is called "forward biased"; it is this bias condition that gives us the low impedance. In contrast to the previous statement when the polarity applied to the transistor is negative on the base and positive on the collector or emitter of an NPN transistor, we notice that the current is very small. This is called "reversed biased". A PNP transistor will exhibit the same conditions when the polarities are opposite to those used for the NPN. Now if we represent the above characteristics with semi-conductor diode symbols they will take the form shown in *Figure 3*.

Semi-Conductor Features

Since the transistor resembles in many ways the semi-conductor diode, let's review the characteristics of such a diode. As the applied voltage is varied from reversed to forward bias conditions, the voltage vs. current plot will take the form shown in *Figure 4*. As shown in the figure the current I_{co}, on the left bottom, remains nearly constant as the voltage is increased. This reverse current, or saturation current in semi-conductor diodes, is called I_{co} (collector to base with emitter open) in transistors. Not all manufacturers give a value for I_{co}. Usually when the maximum value for I_{co} is given a typical value will also be given. Most germanium transistors have an I_{co} of 10μa or less at room temperature (25°C). The temperature at which the I_{co} measurements are made is given because I_{co} is very temperature sensitive. Approximately, I_{co} doubles for every 10°C rise in temperature. So for an I_{co} of 10μa at 25°C we can expect approximately 20 μa I_{co} at 35°C. The presence and variation of I_{co} is very important and its effect should be examined in each application of the tran
Using our simple test-set connected be
base and collector, positive on the collect
negative on the base of an NPN, and ju
reverse for a PNP, will give us the va
I_{co} for the particular transistor. Leavi
test-set connected to the transistor and h
the transistor firmly between the thum
fingers, to raise the temperature of the
will show this increase in I_{co} with a rise i
perature, providing the ambient temperat
reasonably below the body temperature.

The current in the forward direction
impedance) of a semi-conductor dio
shown in *Figure 4* changes nearly expone
as the applied voltage is increased. Th
ward resistance is nearly the same for all
and is given approximately by R-forwa
$\frac{26}{I}$ where I is the current in milliampe

Up to now the transistor has looked
much like a couple of diodes. The foll
measurement will show the amplifying c
teristic (α) that makes this pair of dio
transistor. If we measure between the col

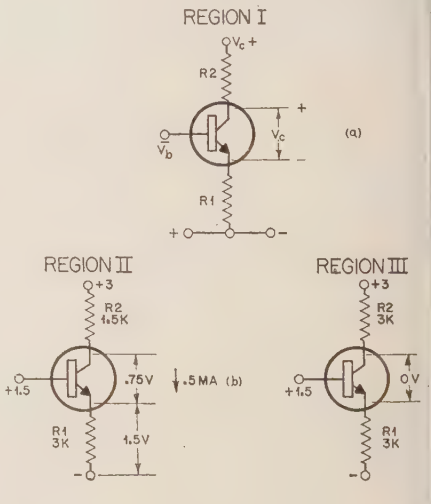


Fig. 9

and emitter with positive on the collecto
negative on the emitter of an NPN trans
(negative on the collector and positive o
emitter of a PNP) we are likely to read
where from near zero to a maximum of 1
If more than one transistor is available, r
ure several of them as mentioned above
notice the wide variation. This variation o
in the normal case and is not so surpr
when the currents in the transistor are anal
The currents in a transistor as defined her
shown for an NPN transistor in *Figure*
is the collector current, I_{co} is the collect
base current with the emitter open, I_b is
injected base current and I_e is the emitter
rent which is the sum of the base curren
and collector current I_c.

Amplification Factors

Compare I_{co}, remember it was measured previously, to the current measured between the collector and emitter which we will call I_c. This is the amplifying characteristic of the transistor that has given us this value of I_c which is many times the value of I_{co}. Assigning the symbols of $\frac{1}{1-\alpha}$ to represent the current multiplication experiences above we can say $I_c = \frac{1}{1-\alpha}$. From this we evaluate α,

$$\alpha = 1 - \frac{I_{co}}{I_c}$$

(This assumes that the transistor is not saturated. Otherwise equations would not hold.) It may take a while to get used to I_{co}; a sometimes convenient way to visualize I_{co} is to think of it as arriving at the base from the collector through some additional path that usually by-passes the heart of the transistor. *Figure 6* shows the above-mentioned analogy and defines the currents. Note, I_c is made up of $\alpha I_e + I_{co}$.

Another method to measure α is by the connection shown in *Figure 7*. Since the current is fixed at 1 ma., $I_b + I_c = 1$

$$I_c = \alpha I_e = \alpha$$

(I_{co} neglected)

The meter reads $(I-\alpha)$, subtracting this from 1 gives α.)

We now have approximate values for two important characteristics of the transistor, α and I_{co}. Also, we have found I_{co} is temperature sensitive and it is not the same for all transistors.

Equivalent Circuit

Let's take a closer look at the transistor. We know that we can describe the transistor action in terms of an equivalent circuit. This equivalent circuit is developed from 3 or 4 terminal network measurements taken while treating the transistor as a "black box". One form of the equivalent circuit is shown in *Figure 8*. From previous experiments we know that this

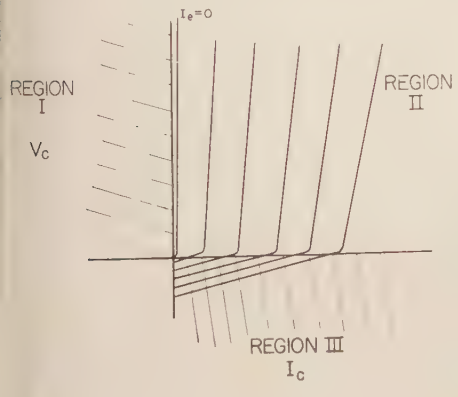


Fig. 10

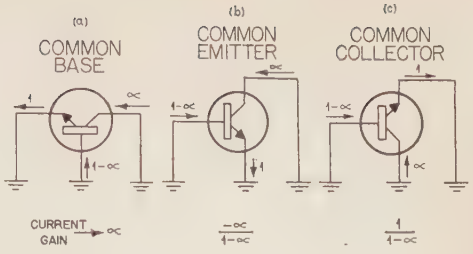


Fig. 11

equivalent circuit does not fully describe the transistor, but it does describe the transistor reasonably well when just the active region is considered. The normal bias conditions for an NPN common emitter stage operation such as a linear amplifier is a positive potential applied between collector and emitter and a small positive potential applied to the base. The transistor's operation can be divided into three regions and they are:

Region I, collector current cut-off or collector voltage saturation. Stated in terms of the potentials applied to the terminals the conditions are emitter "junction" (diode) reverse biased and collector junction reverse biased.

Region II, active region, sometimes called linear region. The emitter junction is forward biased and the collector junction is reverse biased.

Region III, collector current saturation, or collector voltage cut-off. The emitter junction is forward biased and the collector junction is also forward biased.

Examples of NPN transistor stages operating in each of the three regions are shown in *Figure 9*. If NPN transistor stages were biased as shown in the examples they would be operating in the regions indicated. *Figure 10* shows the various regions of operation graphically. The parameters, collector voltage vs collector current are shown.

Linear Region Operation

The linear region, Region II, is of most interest to us here. The other two regions of operation, most pertinent to switching and pulse circuits, are mentioned so as to show the bias and other conditions that might result in improper operation of a linear stage. The examples in *Figure 9* are to give an idea of what happens to a linear amplifier if one parameter is altered without due regard for other parameters. The transistor bias condition shown in part (b) of *Figure 9* places the operating point in Region II. A positive potential of 1.5 volts is applied to the base through a low dc impedance path (suitable ac impedance so as not to shunt the input signal) and with the emitter resistance R_1 of 3K will result in an emitter current of .5 ma. (The base and emitter voltages are approximately equal.) To get the maximum voltage swing at the collector, with

VC of 3V and I_c approximately equal to I_e, R_2 will be 1.5K. If for example R_2 was made larger than 3K the voltage between the collector and emitter would be zero or nearly so and the transistor would be in region III, (part C *Figure 9*) that of collector current saturation. This simply states that all of the current available at the collector of the transistor is passing through it. If a sine wave signal was applied to the base with R_2 of 3K the output signal would be a half sine wave. They would be positive pulses because at the input *additional* current supplied by the input signal would have little effect on the output. The negative half cycles would reduce the base current and thereby reduce the collector current by $\beta = \left(\frac{\alpha}{1-\alpha}\right)$. Now, if the bias potential applied to the base is reversed as shown in part (a) of *Figure 9* the collector current is zero (neglecting I_{co}) and any signal applied to the base would have to exceed 1.5 volts to appear in the output. This bias condition places the transistor in region I. The stage is cut-off (sometimes referred to as blocked) for input voltages that are less than 1.5 volts.

Most of the aforementioned material has been with the transistor connected in a common emitter (sometimes called grounded emitter) connection. There are three basic connections of the transistor: (1) common base or grounded base (2) common emitter, grounded emitter and (3) common collector, grou collector. These connections are shown *Figure 11;* only the currents are shown to plify explanation of the current gains. If the circuits, we assume an input applied to left and the output on the right, we can de an expression for the current amplificatio each. If the currents of emitter and colle are 1 and α respectively, obviously the currents must be $1-\alpha$ as shown to sa Kirchoff's current law. Dividing the ou currents by the input currents we obtain current gains as follows: For the common we get α, for the common emitter connec we get $\frac{-\alpha}{1-\alpha}$ and for the common collector get $\frac{1}{1-\alpha}$.

The grounded base and grounded colle have no phase shift from input to output the sign of the current gain expressions positive.

For the grounded emitter there is 180° ph shift and the sign of the current gain exp sion is negative. *Figure 11* shows the a examples with their respective current expressions.

The material presented here has been very general nature. The intent is not to vide design formulas but to develop an un standing of transistor circuitry that will en the newcomer to more readily understand m exact design principles.

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how NOT to

In designing a power supply, don't make this grim mistake.

Here you see an almost innocent-looking combined B+ and negative bias supply. This is OK, *unless* you try to switch the B-supply by a commonly-used center-tap switch. When this *is* attempted, a brilliant but wholly unwelcome pyrotechnical display will result. Reason? Take a look at the circuit. With the centertap ungrounded, the diode of the b rectifier is suddenly handed the entire pl current of the main supply, and at volta much higher than those for which the ordin bias rectifier is designed. Poof!

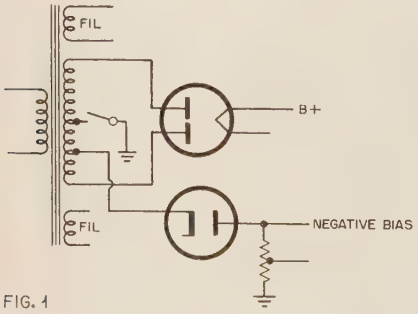


FIG. 1

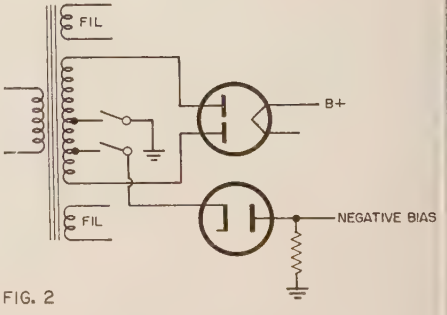


FIG. 2

To avoid this, the standby switch can changed to include a set of contacts to op the lead from the transformer tap to the b rectifier. Or, of course, a separate transform can be used to supply voltage for the b supply, such as a reverse-connected filam transformer tapped across the regular a-c f ment leads.

W2E

. to r, upper row: borosili-
:ate glass, titanium, molyb-
denum, aluminum, tantalum,
stainless steel, tungsten,
ceramic, cobalt; lower row;
sample of Wood's metal,
tinned stainless steel, "load-
ed" grinding wheel

Reprinted from Chemical and Engineering News, Jan. 30, 1956

Soldering on Glass

Joseph C. McGuire was at work in the Los Alamos Scientific Laboratory's chemistry and metallurgy division studying the use of ultrasonics to solder difficult materials. In attempting to clean up some unsuccessful joints with a grinding wheel (something apprentice mechanics are taught not to do), he noticed that not only did the wheel get gummed up with the soldering alloy, but also a brightly tinned surface which looked solderable was left.

Investigating further, he found that the tinned surface was indeed solderable; the joints so formed were stronger than those made by the ultrasonic method. Extending his experiments, he found that such difficult or "impossible" materials as glass and cobalt were also solderable in this way.

The aircraft and electronics industries, laboratory equipment makers, and the do-it-yourselfers will find McGuire's method a boon. Soldering of such materials as aluminum, stainless steel, glass, and ceramics is possible without use of special equipment. McGuire used a medium grit grinding wheel, ¼ inch in diameter and ½ inch long, mounted on a ⅛-inch diameter shaft. Size of the wheel is not critical but the type used by McGuire seems best. Several wheel compositions were tried by the researchers; they all seemed equally good. Additionally, the two surfaces need not be of the same material: metals, soft glass, boro-silicate glass, and ceramics have been soldered in any combination.

For the do-it-yourselfers, here's how:

The grinder is turned on and the abrasive wheel (preferably preheated by grinding metal or the use of heat) is brought to bear on a soft solder such as Wood's metal or 60-40 lead-tin. The soft solder melts and flows onto the surface of the wheel, "loading" it and incidentally making it useless for its customary purpose until it has been trimmed down. The solder-loaded wheel is then applied to the surface to be soldered until a slight amount of abrasion has taken place, using the pressure ordinarily used in grinding. The heat of friction again melts the soft solder, which flows onto the freshly abraded surface and forms an intimate contact.

After this tinning operation, soldering is done in the usual manner with standard 50-50 lead-tin solder. An effort should be made to keep the hot iron from the subsurface layer of base metal. The joint should be heated either by applying the hot iron to some adjacent part of the metal which is not tinned, and the solder then applied in wire form directly to the tinned surface, or the solder applied to the iron bringing the hot drop of solder down to the tinned area without having the iron come into actual physical contact with the base metal. Workers at the lab say this is particularly important when soldering titanium, niobium, and tantalum. The other surface is also given the new treatment if it is a material not ordinarily "wetted" by solder. No soldering flux, surface

[Continued on page 121]

Capt. White (L)
receives pouch
Dr. "Bob" W

Pony Express 1956

Bernard Paul, W5YVJ
Lazy "P" Ranch
Houston, Texas

First the sonic barrier fell, then the four minute mile, and now the 75 year old Houston-to-Austin Texas horseback record has fallen! When the news was flashed around the globe to the anxiously waiting fans, an important sidelight was largely overlooked. Namely, HAM RADIO HAD COME THRU AGAIN! Ham radio, that is, in the guise of the Sheriff's Mounted Posse and the Sheriff's Emergency Communication Corps, both of Harris Cou Texas.

The distance between Austin and Hous is 165 miles and the previous record was 1 hours. A horseback run between these cities under any circumstances is quite a tr since the two points are separated by doz of small towns, several largish cities, countless overpasses, underpasses, Buic Cadillacs, Rolls-Royces, bars, frozen cust joints, and other manifestations of Twenti Century Texas Culture. In order to break record, a high degree of coordination was quired of all participants as well as the sorted townspeople along the way. After even in Texas, a guy on a pinto pony gallop thru a cloverleaf intersection on a Satur morning is bound to cause some talk, if no few traffic snarls.

The ostensible excuse for all this bruha was to deliver an invitation to the Gov. Texas, Allen Shivers, to the Greatest Livesto Exposition and Rodeo which was being h

Bernard Paul, W5YRJ, President of Sheriff's Mounted Posse watches Governor Allan Shivers read his invitation.

n Houston beginning the 28th of last January. ncidentally, Shivers was speaking in Fort Vorth the morning of the run so it was im- erative that we get him to Austin in time to neet the last rider carrying the message. In a vay it might have been a much funnier story f Shivers couldn't have made it after all the nad galloping and shouting but the soreheads n the crowd insisted that we see to it that he e present. So just as when any other problem rises in Texas, a BIG OIL MAN was consulted as to what to do about getting the Governor from one place to another. The OIL MAN knew what to do instantly. He and his family had planned a picnic for that weekend n Acapulco and they were going to use his port-type DC-3, but he could easily change his plans and use his family-type DC-7, thus nabling him to lend us the DC-3 and two spare ilots to fly the Governor to Austin in time to neet the 2 p.m. mail-horse from Houston.

The Texas Highway Patrol represented by Capt. Rose agreed to help us out and they also volunteered three patrol cars to accompany he riders in laps of about 55 miles each. A nice ouch was added when the Harris County Emergency Corps sent along a nice white ambuance to trail the riders. The Mayor of Brenam, Texas, Reese Lockett, whose town was n the route, offered to set up the whole crowd o breakfast when they galloped thru. Since Brenham was about 75 miles along the trail e had plenty of customers for his bacon and

W5YRJ/M

eggs which he and his city council fried up personally in a huge Texas-Style pan. The coffee was hot and good.

I should explain that the riding was done by members of the Sheriff's Mounted Posse of Harris County. They are a mounted group deputized and ready for any kind of action, provided it's on horseback. There are about 100 members who come from all professions and trades from around the Houston area who are bound together by the love of horseflesh and open air. Operating two man teams, the posse rode the race on a relay basis. One member of the team would ride while the other, and his horse, was transported ahead about a mile. The first rider would pass the message

[*Next page*]

Standing l. to r.; W5RPH, Jack; W5RMX, Dick; W5SDR, Ed; W5LOF, Musty; W5EKT, Wes; W5ENT, Ralph; W5YVJ, Paul; Gov. Shivers;; W5URM, Red; W5PBX, Bo; W5URJ, Chris; W5FDZ, Brown.

on to his partner who would then ride ahead a mile and hand on the pouch to a new pair of riders. He then joined his partner and horse in the trailer which would drive them about thirty miles up the route to begin the cycle all over again. In this way each rider carried the mail about six times. All trailers were numbered so the radio cars could check on progress and keep track of who was doing what at any given moment. Ham radio was represented by six radio cars carrying two ops each. They ranged the entire route patrolling assigned areas keeping in constant contact from one end of the trail to the other noting progress and coordinating traffic control. A most necessary duty. The pace car was equipped with a Sheriff's *Link* 2 way communicator and 50 watts of signal on 3855 kc. Radio car #1 contained W5FDZ and W5PBX; they were responsible for setting the horses out at measured miles. Car #2 contained W5ENT and W5RMX and acted as assistant to Car #1. Car three stayed midway between Pace car and Number 1 and acted as a check point for the riders, this car was operated by W5EKT and W5LOF. W5URU and W5URM were in #4 running two miles ahead of Pace Car. Their job was to alert the riders on the trail of the approaching pouch. The Pace car itself dr alongside the rider and protected him f traffic as he rode on the shoulder of the r thru the pitch darkness. He directed traffi intersections and in general ran interfere for the mounted man. Trailing behind the wh pack was car #5 manned by W5SDA W5RPH. They remained with the riders they loaded their mounts into the trai (which was sometimes rough with tired hors and notified the lead car that all was on road. During the dark night hours we identi ourselves on the air as "Pony Express N which no doubt confounded many a guy tu into 3855 at the other end of the skip.

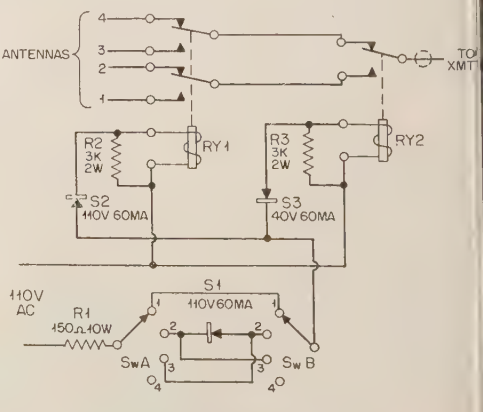
Once we got on the road, we never stop and the thing went off without a major hit We rolled into Austin 9 hours and forty m utes after we had started from Houston miles down the trail. Eight screaming mo cycle police escorts led us thru town to the pointment with the Governor on the Cap lawn where with due ceremony the ha painted scroll and invitation was deliver After the pomp had subsided, all hands stro over to a leading steakhouse and sailed i the finest Kansas City (I have to give the d his due) steaks in town. We all had a ball.

Two Wire Control for Selecting Beams

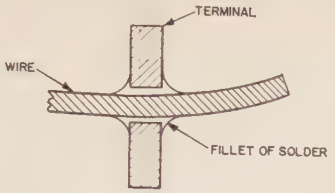
This unusual and simple device is used at CX2AY to switch any of four different rotary beams, supported on a single mast and fed by a single coaxial cable. It is very simple, requiring only two wires between shack and tower. It consists of a 2-pole 4-position switch (S_A, S_B) which selects the desired antenna, 3 selenium rectifiers, 110 V. 60 ma. each (S_1, S_2, S_3), two 110 V. a.c. relays, one 2-pole 2-position (Ry_1) and the other 1-pole 2-position (Ry_2), a 150 ohm 10 w. resistor (R_1) and two 3000 ohms 2 w. resistors (R_2, R_3). The system is fed with 110 V. a.c.

Relays $Ry_1 Ry_2$, with their respective selenium rectifiers S_2 and S_3 and resistors R_2 R_3 are placed at center of boom, and switch S_A S_B, rectifier S_1 and resistor R_1 are located at any convenient position in the shack, so there are only two wires, besides the coaxial cable which go to the antennas.

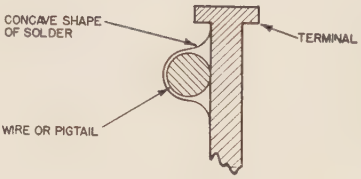
Operation of the system is as follows: in position 1 of S_A S_B, both relays are energized with 110 V. a.c. so they close and antenna 1 is connected to transmitter. This is the position the diagram shows. Position 2: pulsating d.c. flows, rectified by S_1; through the winding of Ry_2. This closes and antenna 2 is connected to transmitter. In position 3 S_A S_B rever the polarity of S_1, so Ry_1 closes, Ry_2 opens a antenna 3 is connected. Finally, position 4 c the a.c. on the windings of both relays, antenna No. 4 is connected to transmitt Resistors R_2 R_3 prevent buzzing of the rela due to pulsating d.c. peaks which appear positions 1, 2 and 3.



Enrique Abal, CX2AY



Vertical cross section through a stud or wrap-around terminal showing the lead adequately soldered.



Horizontal cross section through an eyelet or tube socket type terminal showing the pigtail or wire adequately soldered.

Solder is Strong Enough

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In the handbooks we read, "Except where bsolutely necessary, solder should never be epended upon for the mechanical strength the joint; the wire should be wrapped around e terminals or clamped with soldering termi-ils." This is not true. It's unnecessary to ake wrapped joints at the terminals before ou apply the solder. Solder alone is strong nough to hold the connection together if a tle common sense and care is used in solder-g.

How many times have you tried to salvage me surplus gear and you spent most of your me trying to untie the solder soaked knots mmonly understood as dependable soldered nnections? How many times have you tried repair or modify your factory made ham uipment and had trouble getting those imped joints loose; perhaps you damaged rts in getting them loose.

Everyone has taken for granted the need for ch mechanical joints, assuming they were cessary. People have said that solder is weak. 's true that soft solder will not support the ll of pliers in a man's hand. But, it will sup-rt small parts, pigtails and circuitry in all ectronics equipment, whether you build it or ur favorite manufacturer builds it for you.

Tests and Theory

Laboratory tests have been made at a gov-nment laboratory to determine just how cessary those mechanical joints are.

Simple soldered connections were made by st laying the wires against the terminals and soldering in place. These connections were put through the paces of shock and vibration, frying and freezing, even far more than that required of military equipment. Would you believe it, these connections held without failure and without need of the usual mechanical joints.

What reasons have you heard for making mechanical joints before soldering? One has been that the solder is weak and that the wrapped or crimped mechanical joint is needed to relieve the strain on the solder or prevent the joint from coming loose. Let's think about this a bit. Before we can have a failure or falling away, we must first have a relative movement between the parts comprising the joint. In any soldered connection the solder has "frozen" the lead or wire in place. The pigtail or lead to the soldered joint is the only part that can move, hence any failures should be there. That's exactly what happened in the laboratory tests; some pigtails broke between the soldered joint and the parts but no soldered joints failed. Since the wires and pigtails are far weaker than the soldered joint, any further work on the joint to make it stronger is unnecessary; like "gilding the lily."

Another reason given for wrapped joints is that in case the solder doesn't take, the wrapped joint makes the necessary continuity. Again, let us back up and take another look. Joints, not properly soldered, corrode in time, get noisy and intermittent or even open up. Without the usual bird-nested wrap it is easy to see that the joint is or is not soldered; you can

find a defective joint.

You see, people have had a false security in the mechanical wrapped joint. Such a connection does not make it any better. Crimped joints, before the application of solder, do not build quality in your ham gear. They are a complete waste of time, effort and expense. We have been "penny wise and pound foolish."

The Way to Do It

If we have been doing it wrong, then how should we do it? Well, it's very simple, but the recommended method depends upon the type of terminals we use. The terminals used most often in ham equipment are designated as "eyelet" terminals. That is, the terminals have holes for the wires, as in tube socket terminals. Other terminals occasionally used are slotted terminals and stud or wrap-around terminals. The preferred soldering method varies with the type of terminal.

Now with the eyelet terminal, simply insert the wire or pigtail through the hole about 1/16 inch beyond and then solder in place. If the terminal is to connect more than one wire, it is preferable to wait until all wires are in place before soldering. If the terminal is slotted, put the wires in the slot and solder. On stud or wrap-around terminals, bend the wires or pigtails in a right angle and just a bit more around the terminal and solder. Do not bend the wire more than a single half turn or "U" turn or we will be back with the old style wrapped joints.

It is a good idea to leave an extension (except in high voltage circuits) on the wire about 1/16 inch or so in length beyond the soldered joint. This extension is useful for holding the wires and parts in place until soldered; bending this extension aside beyond the terminal holds them in place.

Of course, we must still use all the rules for good soldering. The wires and terminals must be clean, free from corrosion, grease, dirt and lint. The terminals must be heated sufficiently until the solder melts and flows as it is touched against the terminal and wires. A bare minimum of solder should be used; just enough to flow in between the leads and the terminal. The grade of solder is not critical so long as the only flux used is resin.

Check the Results

The soldered connection can be tested visually and mechanically. If you can see that the solder has tinned the surface of both the terminal and the wire, that the flow of solder has formed a "fillet" in a concave shape, you are assured of a good continuous soldered connection. If the solder bulges, look further. It may indicate a resin joint, a cold solder joint or just excess solder. A good soldered connection is bright and shiny. A chalky appearance probably means the wires moved as the solder was setting. An unsoldered connection can be seen if there is no clutter of wrapped and knotted wires. On the mecha test, if the wire moves, it *ain't* been solc yet.

Advantages

The advantages of this simpler methoc many. Your equipment is easier to wir takes less time. Manufacturer "A" or "B" spend less money on wiring and more on tl more important such as stable oscillator quality parts. You can be sure of no nois intermittent joints. Most important of all, can repair or modify equipment with less ficulty, less likelihood of damaging parts i moving wires and leads. This enables yo use parts over and over again, and shouldn't you? Parts cost money.

Mr. Manufacturer, please make connec this way in my future receiver and other equipment. You, Mr. Manufacturer, have working too hard on connections and cau me much trouble later when repairs bec necessary.

I have been making soldered connec this way in my mobile equipment for at ten years and I have never had a soldered fail. You make them this way too and y will not fail either. A government labora tested many many such connections u exaggerated environments without failure soldered connections.

CHU--More Time Signa

That WWV monopoly has been shatte Starting back in January Canada has sending time signals from station CHU Ottawa on 3330 kc, 7335 kc, and 14670 which will probably sneak through the of the dial on some ham-band-only recei The time is announced once each mi by voice. The signal consists of ¼ sec pulses of 1000 cycle tone. The beginning the pulses mark the seconds. The first puls

each minute is longer. Pulses are sent for f seconds, then the voice announcement is lowed by the next series of pulses. The vc announces the minute coming up. The quencies involved are not to be considered standards. The time pulses are accurate t few hundredths of a second.

Stability In The VFO

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The term "VFO" has become standard ham language; unfortunately too many oscillators on the air are, indeed, *variable* even more than they are *adjustable*. What's wanted, of course, is an adjustable frequency oscillator that will not vary.

There is going to be no circuit diagram with this discussion—because the work I've done on the VFO problem indicates that a circuit diagram is of relatively little help in achieving a really stable and accurately adjustable unit; shop drawings would be far more suitable.

Why a shop drawing would mean more to oscillator stability than circuit diagrams is the thesis of this discussion; the *geometry is the one thing that is important in achieving oscillator stability.*

In trying to figure out problems, it's handy to borrow the techniques of the research scientist. When a chemist wants to study an element, to determine its properties, the first thing he seeks to do is to prepare a *pure* sample of that element.

The real test of an audio amplifier is its ability to handle a square wave.

Each of these research test efforts is based on taking the extreme case—the technique of going to the ultimate, limiting extreme, and studying what happens there. The chemist wants *pure* glopium for his research, so he can make sure that what he finds as a property belongs to glopium and nothing else. The audio hi-fi addict wants to test with a square wave, because that is the extreme case of transient response problems; it whams the amplifier system with two violent transients per cycle, and if the unit has any tendency to ring, it will have every possible opportunity to do so.

The extreme case is a handy way of testing an idea—by taking it to the extreme, to see what happens.

In the case of a VFO, let's consider a one that has been built as a bread-board unit. The coil, condenser, and all the wiring are out on top. Set it to, say, 3.950 megacycles with your face 2 feet from the board, and—this is literal fact!—if you wiggle your eyebrows, it shifts frequency.

Wiggle one of the wires on the bread-board, and the beat note in the receiver goes *woo-woo-whee,* but good.

Now make up a unit with a padding condenser using the sole of a discarded shoe for a dielectric. It'll make a fairly good hygrometer; every time the humidity changes, so does the frequency.

Well, we can use an air dielectric; we'll mount one plate on a nice ceramic insulator, and suspend the other on a handy war-surplus screen-door spring. If nobody causes any vibration whatever, it'll be pretty stable. Of course, it'll also act as a lo-fidelity f-m modulator if you talk near it.

Taken to these extremes, the nature of the factors that cause instability in VFO's is clear enough. Trouble is, people tend to forget that the extreme stability we want *is itself an extreme.* A good, workable, moderate degree of oscillator stability is easy to achieve; the little midget portable radio receivers do that. Their oscillators are pretty fairly decently stable. But when some ham wants to use a VFO on 2 meters, and wants to keep the drift below, say 100 cycles—that's extremely extreme. You're demanding a stability better than 1 part in a million. Achieving that is just as extreme, in its own way, as using old shoe leather dielectric, or spring-mounted condenser plates. You're going to have to take extreme measures if you want that order of stability in your VFO—and you do, actually.

Exactness Counts

Now notice this: I didn't mention what circuit that odd breadboard set-up used. Maybe it was Hartley, maybe a Clapp, or perhaps a tuned-grid-tuned-plate circuit. It makes no difference whatsoever, does it? No matter what electronic circuit was used, the thing will be just exactly as lousy as its construction. If you've got the coil dangling on the end of a loosely hung wire, the electronic circuit doesn't count for anything; it'll be a slop-happy oscillator.

But we can go even further than the recognition that bad construction will make any oscillator unstable; geometry determines frequency, *not electronics.*

That statement sounds cockeyed, I know—but it isn't. Consider the typical quartz-crystal oscillator; the *geometry* of the quartz slice determines its natural frequency—and because that geometry is enormously rigid, the circuit used external to the crystal has very minor effect on the frequency.

But much of the effect of the external circuit is determined by the geometry of that circuit! If a triode oscillator tube is used, coupling from oscillator circuit to load must directly involve one of the active elements of the oscillator; if a pentode oscillator is used, the *geometry* of the pentode allows the use of the electron-coupled output circuit.

The capacity of a condenser is determined by the area of the plates, their distance apart, and the dielectric constant of the space between —it's purely a geometrical problem. The dielectric constant itself, turns out to be a matter of atomic-molecular geometry; the extremely high dielectric constant of the titanium dioxide ceramics is due to the fact that the titanium atom can undergo strong displacement in the crystal latice formed by the oxygen atoms around it.

The inductance of a coil, again, is a matter of the number of turns, the diameter of the turns (which means the area enclosed) and the length of the coil. Varying any one of these factors varies the inductance — and they're purely geometrical factors.

Exactness Counts

Now if you want to put a thread on a ⅛th inch thick brass rod, so you can put a 6-32 hex nut on it, any sloppy old die can cut a satisfactory 6-32 thread for that purpose. But suppose you want to cut a thread on a steel shaft for use in making a micrometer? For this, you don't use 75¢ dies; you use a precision toolmaker's lathe.

When you're trying to make a VFO that's capable of micrometer accuracy—you don't use standard, sloppy right-angle drive gears, for example. You don't use dial-cord drives, either. You're trying to get 1 part per million accuracy —and brother, you can't have 1 part per thousand accuracy of your components, and expect a part per million accuracy in the resultant.

I have a VFO, the result of many, many, preceding experiments, that has a stability of 1 part per 2,000,000 over a two-hour test. Its warm-up drift is about 10 cycles at 4,000,000 cycles, and is completed in about 10 minutes. It uses a simple Hartley circuit, with an untuned buffer amplifier followed by a buffer-doubler stage. It can be reset within 50 cycles at 4,000,000 cycles. The output is 30 milliwatts into a 72 ohm coax—which is adequate to drive a 6AG7 hard enough to drive a pair of 813's to 500 watts output on 75 meter phone. A 6AU6 can be driven to act as a doubler, and drive a 6SJ7 more than enough to get full drive in an 832 push-push doubler driving the 813's on 10 meters.

Item: You do NOT need 5 watts output from a VFO; that's what an exciter unit is for. And a 6SJ7 or 6AU6 gives plenty of output to drive high-power-sensitivity tubes; it does not take a 6L6 to drive the grid of a 6L6, you know. Many ham rigs use outrageously inefficient low-level stages, which contributes to harmonic problems, but doesn't contribute a thing to satisfactory operation. A 6AG7 can be driven far more than enough for normal exciter purposes by 30 milliwatts; operating in Class A, a 6AG7 takes practically zero milliwatts, and will give a 130 volt swing across a 3500 ohm resistor!

Then a high-precision VFO does not ha be a power stage system; don't use you crometer as a screw jack for lifting your mobile, either. A chronometer is not a su source of mechanical energy; it's designe something else, and won't make a satisfa power source for a kitchen batter-mixer.

Keep the power-level in the VFO *low* precision unit I have operates with 28 vol plates and screens. If I were redesigning rebuilding now, I'd build around the 1.5 25 milliampere filament tubes intended fo tery operation. Even using 6.3 volt 300 heater type tubes, there's so little heat g ated in the VFO unit that I use *no* temper compensation; radiation to and from the environment is adequate, because I've us good, roomy cabinet—primarily because black crackle finish of said cabinet off couple of square feet of heat-dissipating su

Instead of temperature compensation, I the whole VFO in a thermostatically contr oven. The thermostat is on the wall, anc oil-burning furnace maintains the temper very easily within about 4 degrees.

Look, friend; your house *is* a thermostati controlled oven! Make your VFO opera room temperature, and you'll have all advantages of thermostatic control.

No temperature compensation can work fectly; the different parts of a VFO will he different rates, no matter how hard you t prevent it. The only thing to do is to con close to no-heat-input as you can, so that won't be any temperature change to compe for. If you'll do all your power-amplificati the exciter, where it belongs, instead of t to make the VFO do two jobs, getting rid o heat problem is simple. Don't have any have so little it doesn't have detectable effe

Incidentally, the heat output of three o 1.5 volt, 25 milliampere battery type filamen tubes, running with a more-than-adequat volts on plate and screen is about on the s order as the heat radiated from your own at a distance of two feet! Getting the heat eration inside the VFO box lower than then, is futile. And trying to compensate that order of heating is also futile—merely ing toward the VFO would throw off compensation!

Any VFO is OK

I don't care what your favorite VFO ci is; I like the Hartley for cathode-heater tubes, and the tickler-coil type for filamen tubes. But use anything you like; it's unim tant, actually. The shop-notes, the mecha structure which is the geometrical structure far more important than the circuit diagra doesn't matter too much what particular lay you use, so long as the layout is rigid to degree of accuracy you want in the VFC you want a part per million stability—

You've got to have one part per million or better stability in the mechanical structure.

Now this isn't part per million *accuracy* in construction; it's part per million *stability*. My VFO is hand-carved, and the ¼"-drill I use has worn-out, sloppy bearings, so the accuracy is definitely low. My "hole-mover-over" (small rat-tail file) is one of my most needed tools. That's not what counts; what counts is that the chassis the VFO structure is built on is a piece carved off of a 1/8th inch thick aluminum relay rack panel. It's supported only at one place—along the front edge, where it was bent down a half-inch and bolted to the light sheet-steel cabinet front. The VFO structure is mounted on the aluminum slab, with *all* r-f wires made of heavy-gauge buss-bar type wire (1/8th inch thick copper) and mounted on ceramic standoffs. It's *rigid*. The coil is mounted on the condenser itself; there's bound to be movement, since no material is absolutely rigid, but the set-up is such that the whole VFO system moves *as a unit*. There is no way that pushing on the cabinet, for example, can stress the VFO chassis. You can *move* the chassis, but because of the one-point mounting, you can't *stress* it.

The VFO shielding can is mounted on the chassis, of course; the VFO-to-cabinet capacitance is cut off, so that movement of the VFO chassis with respect to the cabinet has no effect. The VFO's actual shielding moves with the chassis, with the VFO, and hence doesn't change the geometry of VFO-to-grounded-metal.

The real problem

The real Grade A Stinker problem is, of course, the condenser and drive mechanism. There, so far as home-workshop goes, you've had it. You can't make the condenser mounting-and-drive mechanism with the needed precision. Further, you can't buy a drive gear and a condenser, and mount them together—unless you also have precision machine shop work as a second hobby. The condenser mounting and drive must be carved out of heavy, blocky chunks of metal; it must have that 1-in-a-million rigidity. The bearings must be centered with extreme accuracy, or, as you tune the condenser, stresses will be applied to the shaft that will act one way when tuning up in frequency, and the opposite way when tuning down. It's a mechanical-geometry problem.

The coil problem isn't very tough. With no temperature change to worry about, mechanical rigidity is the only problem. I find that the Air Dux and B & W Miniductors work fine, if you slip the 3/4" size inside the 1" size, and polystyrene cement the two together, mounting the whole unit on a polystyrene strip. The finished system is rigid enough, when stand-off mounted either on the condenser, or on the heavy-duty chassis, to give the needed stability. With a ceramic coil form, there's the gimmick of winding the wire on the coil, while keeping it as hot as you can handle without getting the coil form all smeared up with pieces of seared skin, and then letting the cooling after it's all wound shrink the wire immovably on the coil-form. (A Variac and a heavy-current filament transformer can keep a considerable length of #18 copper wire quite warm. Ten amperes will do, fifteen is too much.)

I tried, incidentally, winding a coil out of that buss-bar wire. It was a hellish job, and didn't do a bit better than the B & W Miniductor; when your oscillator is running a total power of 5 to 10 milliwatts, you don't overheat even a #22 wire. Again—the buffer is the place where power output begins; you don't *need* power in a VFO oscillator.

In padding condensers, the thing that counts is not precision of value—you're going to calibrate the oscillator anyway. Stability, not accuracy, is what you need. The silvered mica jobs are stable. Ceramic padders may do . . . . but the silvered micas are superior.

Gears

Commercial precision tuning condensers are expensive; Cardwell's beautiful little condenser, specially designed for precision oscillators, sells for around $80. Commercial instrument makers wouldn't pay that money for them if they didn't appreciate the reality of the problems involved.

National makes a magnificent unit, using the HRO type dial drive, and a fine precision condenser attached, for about $30. Incidentally, the condenser and drive must, for optimum results, be built as a unit; you can't get the precision you want by buying dial drive and condenser separately, and home-hitching them.

The tuning condensers used in the ARC-5 series of transmitters have excellent worm-drive-and-condenser systems; if you can lay hands on one of them, it'll do a fine job for you, but it isn't built with the massive solidity you really want. Even the ARC-5 series receiving condensers are pretty good units, though they, too, lack the massive rigidity that would be ideal.

There was a tuning unit designed for use in tanks; the double condenser units, once upon a time, were selling in surplus, in the original, unopened sealed tin boxes, for $2.98. Them days is definitely gone forever; I've heard that people are offering $15 for the worm-and-gear from those jobs alone. They are, of course, ideal for VFO use . . . if you can find some innocent sucker who'll sell you one. They have all the delicate fragility of the tanks they were meant to be used in; they've got solid brass end-plates about a quarter of an inch thick, and if dropped ten feet onto a concrete floor will probably crack the floor. They were intended to maintain calibration under the rugged conditions of an army tank, and for precision VFO's they're wonderful.

[*Continued on page 91*]

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Trailer Ham

It is doubtful if there is a pipe-dreaming amateur in existence that hasn't leaned back in the old operating chair, stared deeply into the glow of a mercury vapor tube, and dreamed of hooking a house trailer (complete with new Zilch 999 receiver and a kw transmitter, naturally) to the family chariot and driving into the jungles of Puerto Tango. Whether you have dreamed, or wondered about, or actually contemplated either taking a trip, vacationing, or living full time in a trailer (called "mobile homes" by the more elite) here are some facts, opinions, and actual incidents of operation from a house trailer.

After being confronted with the rent housing situation on the east coast, the XYL (who incidentally is W5TSE) and I decided that we would take the big plunge and purchase one of these homes on wheels. We found we could purchase a trailer complete with furniture, kitchen stove, refrigerator and all the trimmings for about half as much a month as comparable rent in that locale. Upon investigation we found that a new trailer with plumbing and a complete bathroom runs about $100 per foot of trailer length including all the fixtures and furniture. This seems to be more or less standard across the nation. Used trailers prices seem to vary considerably throughout the country. Don't have the idea that you will save any money while you are traveling with a trailer. People have approached me many times with such statements as, "You must save a lot of money in food and motel bills when you take your trailer along." I would be glad to pay their food and motel bills if they would pay for the extra gasoline that I burn, not to mention the tremendous wear on my car's clutch and back tires. Even with all the disadvantages it is nice to be able to move all your belongings, including your home, within 30 minutes. Not to mention the fact that you are assured you will have a place to live upon arrival at your destination. One other things; It's Yours —All yours!

Parks

About now would be a good time to dis some of the aspects of where you are g to park your trailer while you are living i If you are going to dwell a hundred miles f civilization in the northwoods or the C desert then I am sure you will have no tr parking problems. Incidentally, if you do to live along these lines don't forget th gasoline driven generator will be needed good old 110 volt put-put is a good thing have while living in a trailer since they c in mighty handy for overnight stops along road when en-route between semi-perma locations. I have seen some very nice put installations just forward of the trailer body the frame.

If you plan your operations a little close civilization a trailer park is by far your bet. Like everything else, trailer parks com three sizes: good, bad, and indifferent. E in the smaller communities the good ones available along with the other types. In r trailer parks the farthest you are likely t from another trailer will be about twenty (unless the proprietor has several vacanci Hold on now, don't take those aspirins Even in such close quarters to the next tra an astounding thing will happen! No TVI! credible? Well not quite, since almost all the modern trailers are covered with alumin and well bonded you are operating within excellent shield. Also, you neighbors on sides live and operate their TV sets within t own shields. By the way, some of the be trailer parks have underground wiring, wh virtually eliminates BCI and line noise. Du the past year I have operated from four dif ent trailer parks in different parts of the co try, and at one of these locations I was 100 miles from the nearest TV station. To I have not had one case of TVI.

In some instances, during the evening ho

he line voltage may drop to a fairly low value. his is due to the fact that trailers usually ave a large number of electrical appliances nd some trailer park wiring systems are not dequate to carry the extra load of all the lectric hot water heaters on during the time veryone is washing the evening dishes. This the exception rather than the rule and if ou do run into an extreme case, a variac ooked to the ham gear to boost the voltage ould solve the problem. So far, I have not n up against a case of line voltage so low at called for such drastic measures.

What Rig?

Now, let's take a look at the equipment situ-ion. I have seen half-gallon[1] to jigger[2] power gs installed in trailers. There is not much use telling you what kind of transmitter or re-iver to use in a trailer, because as any self-specting red-blooded ham would do, you will e what you dog-gone please anyway. If you an on running much over 100- to 150-watts phone, be sure and check the 110 volt iring in your trailer. Most trailers have smaller ire than you would normally find in a house, d this may necessitate a separate wiring rcuit for high power operation. Unless you ke to buy a new rig every time you move be re that the rig is properly secured before you ke-off on a cross-country jaunt. If your gear not substantially bolted down, place it on e floor and put some kind of padding around Under any circumstances do not put it on e bed or divan (I could tell you a sad tale woe about trying this, but your tears might ake the pages stick together). There is quite bit of vibration in a trailer while it is in mo-on, and although you won't be able to notice this vibration will cause loose objects in the ailer to slide and shift around quite a bit. ist where to locate the rig in a trailer is rictly a matter of choice (and the XYL's ap-oval). Since trailers differ considerably in spect to interior design, you will have to use ur ingenuity. Probably the nicest trailer in-allation that I have seen was built into a all closet about the width of a relay rack. hen the closet door was opened a desk top opped down directly in front of the rig. The g here runs about 100 watts on 80- thru 10-eters AM and CW.

Sky-Wires

Antennas presented quite a problem at first. nce trailers are quite thick and constructed that it is not practical to bring the feed-line ru a window or wall, this presented a prob-m. After discussing the situation with a tele-one installer I found that they brought their es thru the floor. (Yes Siree, they put tele-phones in trailers.) The feedline hole can be drilled in some inconspicuous place in the floor, such as under a bed, and plugged up with a small cork if and when you decide to remove it. Although I have been in places where it would have been possible to put up a good sized V-beam or rhombic, I have found a multi-band vertical very handy and practical. The vertical in use consists of a number of surplus 3 foot antenna sections that screw together and are mounted on a surplus base insulator which is bolted to the side of the trailer by means of an "L" bracket. The antenna is fed at the base as a quarter-wave using the trailer body as a groundplane. At semi-permanent installations I ground the trailer body to a cold water pipe or ground stake. To get a quarter-wave on 10-, 15-, and 20-meters, I just screw the proper number of sections together to get the right length. On 40- and 80-meters I screw six of these sections together, which gives me an 18 foot vertical, a loading coil is then inserted at the base to make up for the lack of length needed to achieve a full quarter wave vertical.

This antenna is easily taken down and stored for moving. Since it is against the law to ride in a trailer that is in motion you might as well take the antenna down while moving. Another good point about having the antenna removable is that you may mount it higher on the trailer body without worry of losing it on low trees or underpasses and such. I also use a two element 15 meter beam that can be taken down small enough to place in the trailer along with its 30 foot telescoping TV mast. The beam is an exact copy of the one designed and constructed by W6SAI.[3] You may desire to supplement the vertical on some bands with other antennas, depending on the space you have available, but the vertical is handy to have and works out very nicely. I might add that I have never had any trouble from trailer park managers about putting up antennas, in fact some have eagerly assisted me in my skywire raising ventures.

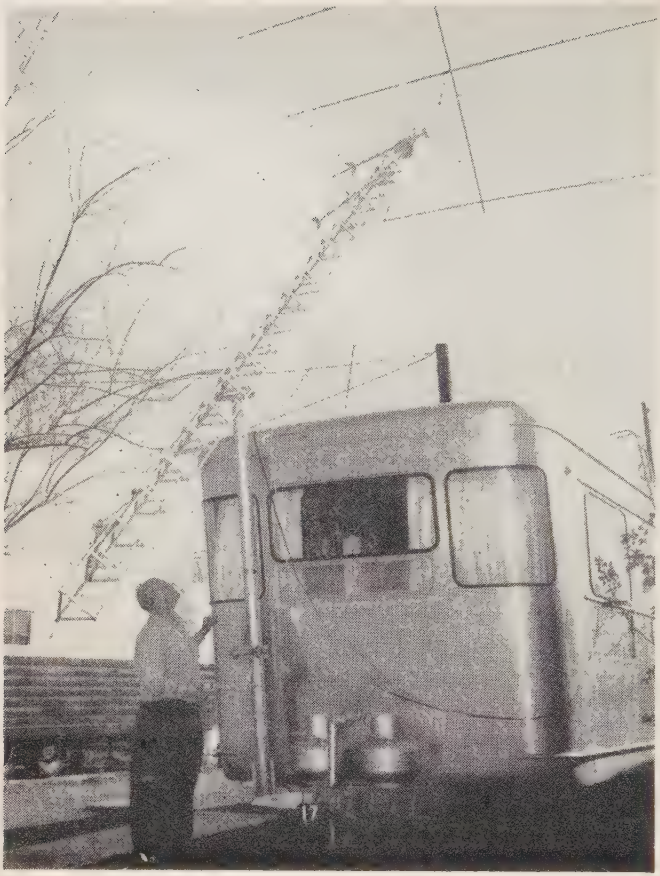
Although it is not too well known, the number of amateurs using this type home is certainly on the increase. I have found only a few trailer parks that didn't contain at least one active ham. A number of these trailer parks had several active hams. Considering that most of these parks had from 25 to 50 trailers, this is a pretty high percentage of amateur populace. Most of the amateurs in trailer parks live in trailers due to the fact that their jobs require frequent to occasional movement of their ham shacks. Needless to say they find it a convenient way of living.

Well, I hope to see you pull your trailer into a trailer park that I am in, but if you're running a kilowatt please don't park next to my 15 meter beam! ■

[1]A half-gallon rig has the capability of one-half kw input to the final r-f stage.
[2]A jigger powered rig depends on the size jigger used.

[3]"20 Meter DX With A 2 Element Beam," William I. Orr, W6SAI, *CQ*, October 1953, page 11.

Bob Bain, W5C
1721 Western
Fort Worth, Texas



Keith lowers the tower. Note how tower support is tied to the main f of the trailer (left of butane bottles) to top frame of the trailer. Mou methods would vary with different tr homes, no doubt.

Trailer Beam

Problem: Beam installation for fixed/portable operation from a house trailer with the following requirements:

1. One man erection and removal of beam
2. Means of transporting tower when in motion
3. Sturdiness

Keith W. Ingalls, W8RXC, confronted with the above situation came up with this idea which might prove informative to others.

At first Keith used a mobile whip and loading coil arrangement (still in use on lower frequencies) for his operation whenever he and his wife settled down for a stay in trailer parks throughout the country. But ten meters started showing signs of life. While many contacts and some DX can be achieved with a whip, it is a generally accepted fact that a beam ma it easier to fill pages of log books with s contacts.

Utility companies take a dim view of pe using their poles as masts, and there is not much room for guy wires in the space allo individual trailers in most parks. With a sh age of skyhooks on the surplus market, t arose a slight problem of how to keep a b up in the air.

The answer was found in one of the cra down, tilt-over lightweight TV towers. Mou on the front end of the trailer, with the b support welded to the main frame of the tra and to the top frame (which had to be be up), the tower provides a place for one of popular three element full-size 10 meter bea complete with rotator.

As shown in the illustrations, Keith also anaged to make a neat installation of his rig one of the storage cabinets of his "living om."

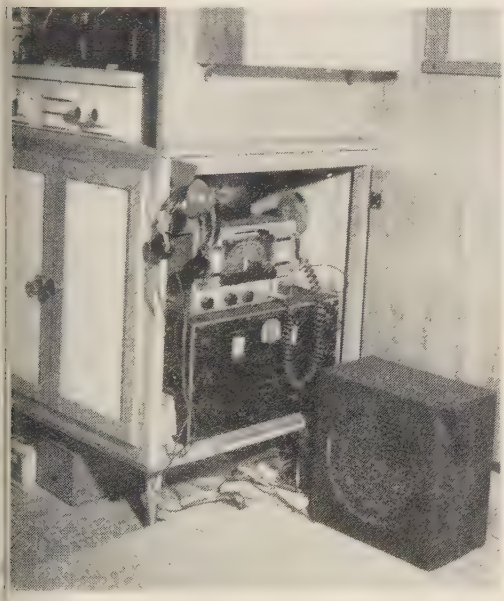
For traveling on the highway, Keith simply wers the tower to its 20 foot length, tilts the wer, removes the beam and rotator, and cures the tower to the trailer's roof. The hole operation including removing feed lines, c., takes approximately 30 minutes. In travelg position the tower protrudes over the towg car's top leaving no overhang at the rear the trailer. According to Keith, by the time s XYL has the coffee pot stored and the inrior of the trailer made shipshape for travel, has the tower lashed and associated gear ored.

Sturdiness? While visiting in Fort Worth, exas, there were gusty winds with velocities aching 45 mph. The beam and tower swayed bit. Once the tower was lowered to the 20 ot level at night. Another time it was left tended to the 40 foot level and no trouble perienced.

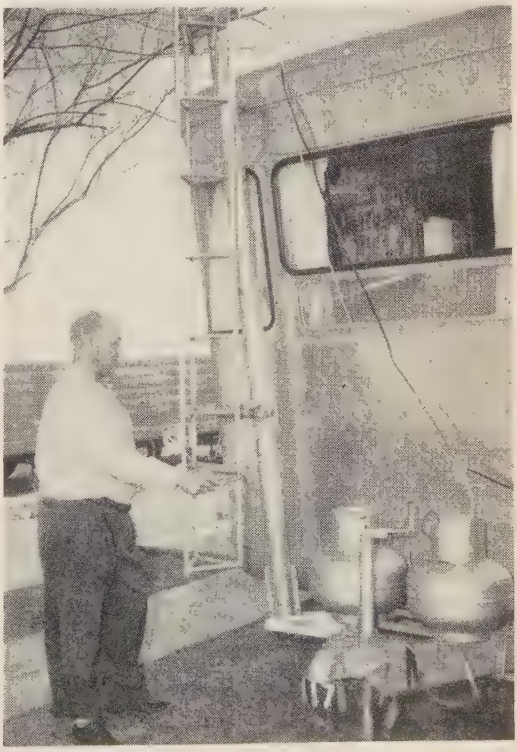
Comfortably located in his "mobile living room" with filaments merrily glowing, Keith renews acquaintance with a W7 he met in person on a previous trip.

The installation has made the trip from Florida to Texas. Managers of trailer parks have given no difficulty. No specifications on the installation have been given as each individual trailer would no doubt call for a slightly different approach.

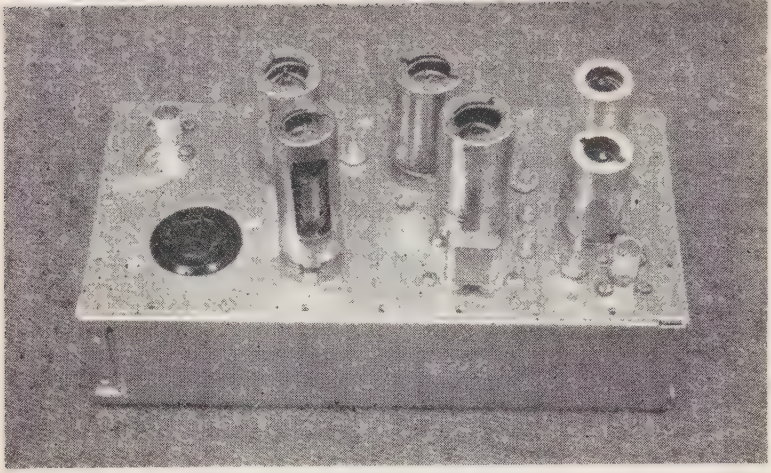
But if you are contemplating a trip in a traveling home there's no need to leave the beam behind. You can take it with you. Besides, it provides a handy place to hang the TV antenna for the XYL. ■



Neatly stashed conveniently close to the kitchen, W8RXC's rig takes so little room that his XYL does not object! When on the road, the speaker is stored in the cabinet on the left.



With tower lowered from its extended height of 40 feet, Keith grabs another crank and tilts it over the roof of his trailer. The beam, rotator and TV antenna are removed and stored inside while on the road. Tower lays flat atop trailer roof and is secured for traveling.



Wayne C. Taft, W1V
35 Myrtle Street
Belmont, Massachusetts

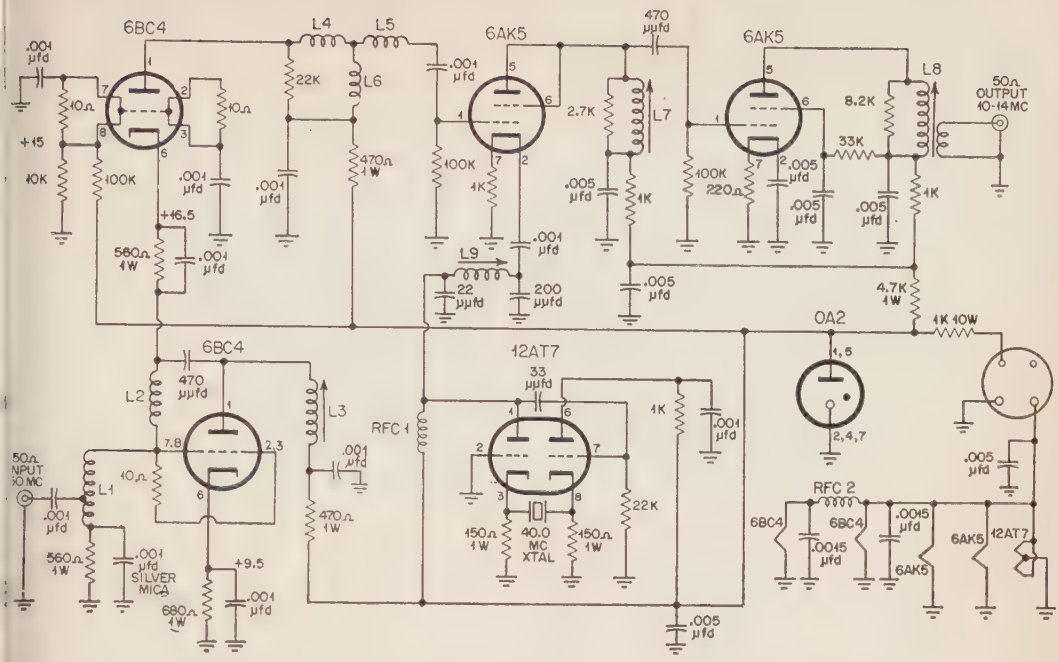
A Low Noise Converter for 50 Megacycle

Since the opening of the six meter band to the Technician class of license last spring, the activity on that band has been on the increase in most areas. Also a contributing factor to this increase in activity is the possibility of more DX due to the upswing of the sunspot cycle. Those who remember the DX of the late forties on six will also remember the enthusiasm with which the latest improvements were added to rigs as new VHF circuitry and components were made available. This continuous improvement of gear has been widespread on the higher VHF bands, but such improvements of 50 mc gear were not so numerous when the DX ceased. Much work has been done to build better and lower noise converters for 2 and 1¼ meters, especially since the larger tube manufacturers have introduced several low noise tubes for VHF and UHF television receivers. Since these tubes are being mass produced for TV, they are quite inexpensive and a VHF converter using them is now well within the budget of the average ham. The converter to be described is perhaps one of the first attempts to use these new tu on our lowest VHF band.

The tube used is the RCA 6BC4 which intended to be used as a grounded-grid amplifier in UHF television receivers. It i triode with a gm of 10,000 μmhos, and the fore a very low equivalent noise resistan Using two of these new tubes in a conventio cascode circuit, a noise figure under 2 deci was obtained at 50 mc. It should be poin out that such a low noise converter would of little use in a noisy location, but that i a worthwhile project for the VHF man w has a quiet location, or who intends to use six meter converter as an i-f strip for 420 a 1215-mc converters.

The 6BC4 cascode r-f amplifier is more less conventional. The biasing arrangement these tubes may seem a bit unusual, but it merely a d-c stabilization circuit which ke the plate current of each stage constant over wide range of tube characteristics. This feat is desirable as the noise figure is depend upon plate current. The 10-ohm resistors u in paralleling the grids reduce the possibi of parasitics due to lead resonances.

A double tuned circuit of the Tee vari is used between the r-f amplifier and mix This type of double tuned circuit is easier adjust and construct than any of the others this frequency. The double tuned circuit off better skirt selectivity than does the low single tuned variety and goes a long way ward eliminating images and i-f pickup.



The mixer is a triode-connected 6AK5 with oscillator injection fed to the cathode. The pi-network used to couple the oscillator to the mixer provides a convenient method of adjusting the injection. Following the mixer is a pentode 6AK5 i-f stage. A staggered pair is employed to obtain the proper i-f bandpass.

The oscillator is the popular Butler circuit using a 12AT7 dual triode. The first half of the tube is the oscillator and output is taken from its plate circuit; the second half is used only as a cathode follower to drive the crystal. With the crystals used, the usual inductor across the crystal was found to be unnecessary. The crystal used was a *Valpey* VR6 40.0000 mc crystal of the overtone variety. It should be pointed out that although the circuit works best with overtone type crystals, many 8 mc fundamental rocks also will work well on their fifth overtone. Remember, however, that under such operation of an 8 mc crystal the output frequency may not be an exact multiple of the fundamental frequency, and thus the overall receiver calibration may suffer slightly. An OA2 provides 150 volts regulated for the converter.

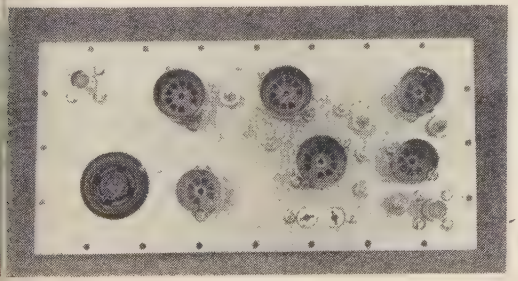
Parts List

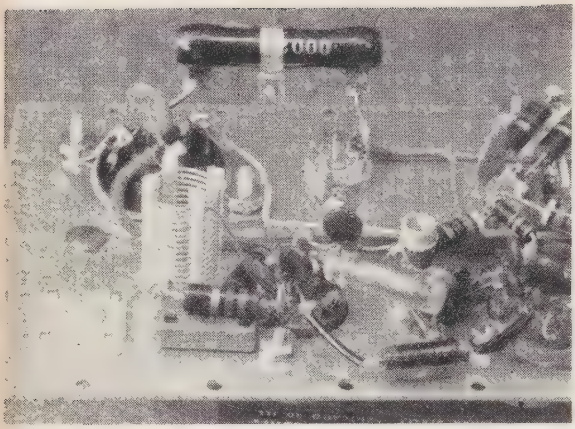
L1—14 T #20 tinned ½" i.d. ⅞" long tapped 4 T from bottom
L2—50 T #34 DSC on ¼" poly rod
L3—11T #16 DSC on ¼" slug-tuned form CTC LS6—red slug
L4 — 24T #34 DSC on ¼" poly. rod } Wound in opposite directions
L5 — 20T #34 DSC on ¼" poly. rod }
L6—5T #20 enam. ⅜" i.d.
L7 } Approx. 20μHy. Wound on CTC LS6
L8 } slug-tuned forms (¼" diam.) red or yellow slug
L8—Link—6T #34 wound on L7
L9—7T #26 DSC on ¼" slug-tuned form CTC LS6 red slug (.7 μHy)
RFC1—National R33 50 μHy choke (yellow dot)
RFC2—Filament choke 10T #20 enam. on 2w. resistor

The writer's model used an injection frequency of 40 mc and an i.f. of 10-14 mc. Actually, any 4 mc band in the vicinity of 10 mc could be used for the i.f. with proper choice of crystal frequency and slight readjustment of the i-f coils.

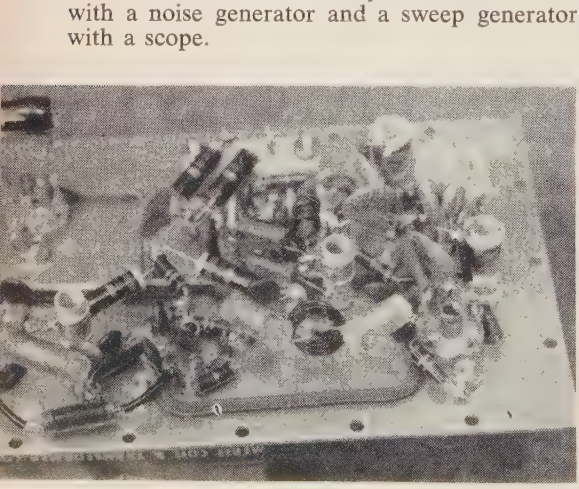
The layout is straightforward, as can be seen from the photographs. In the underchassis view, *Fig. 2*, the power socket, OA2, oscillator, i-f stage, and i-f output jack are located in that order from left to right along the upper half of the chassis. The input jack, r-f stages, and mixer are located from left to right along the bottom half of the chassis. The converter is constructed on a 4" x 8" aluminum plate which in turn is mounted on an inverted *See-Zak* chassis. Construction is simplified by wiring the converter before mounting the plate on the chassis. It is important to remember when wiring the unit to keep all lead lengths to a minimum, otherwise the performance may suffer.

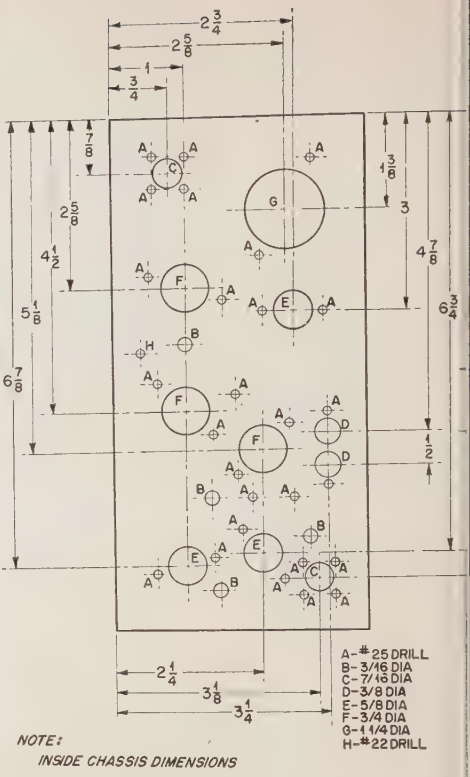
If the layout shown is followed closely, no trouble should be experienced in getting the





converter to work properly. Adjustment is simplicity in itself with the proper equipment. All that is necessary is an *accurately calibrated* grid dip meter. First, be sure that all tubes and shields are in place, and that nothing is connected to the input and output jacks. Check the frequency of *L1*—it should be somewhat lower than 50 mc—somewhere in the vicinity of 48 mc will provide the optimum noise figure. *L1* and *L2* should require no adjustment if the coil specifications are followed closely. The adjustment of *L3* is not critical; it may be dipped to the center of the band. To adjust *L4* and *L5*, first disconnect one end of *L5* and dip *L4* to 51.5 mc. Then reconnect *L5* to the circuit and disconnect one end of *L4*. Dip *L5* to 51.5 mc and reconnect *L4* to the circuit. This completes the adjustment of the r-f stages. To adjust the i-f stages, disconnect one end of the 2.7 K resistor across *L7* and one end of the 8.2 K resistor across *L8*. *L7* is then dipped to 10.3 mc while *L8* is dipped to 13.5 mc. Reconnect the loading resistors, and this adjustment is complete. Finally, dip L9 to 40 mc. When power is applied to the converter *L9* should be adjusted for minimum mixer plate current. This method of aligning the converter should yield quite good results, however a more accurate job could be done with a noise generator and a sweep generator with a scope.

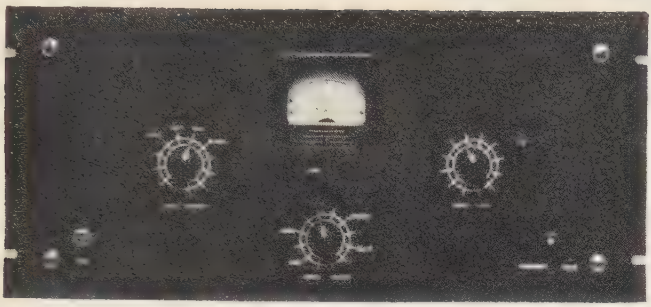




The power requirements are 6.3 volts @ amp. and 250 volts @ 50 ma. If a 150 regulated supply is available, the OA2 and dropping resistor may be eliminated.

Like most crystal controlled converters, one is not without a few spurious respon They have, however, been reduced to a m mum. With the receiver tuned to 51 mc, response at 29 mc (10 meters) is 35 db do the response at 69 mc (Channel 4) is 55 down, and the response at 91 mc (F-M ba is 72 db down. The second harmonic of oscillator produces the latter two responses. these responses, only the one at 69 mc g any trouble at the writer's location. This because of a strong local TV station on ch nel 4. The interference was completely eli nated by a parallel—tuned series trap in antenna lead. Note that if the i.f. were 14 mc, the same trouble would occur with ch nel 2. No trouble has been experienced w 10 meter images as yet, but a simple high-p filter would no doubt eliminate this sort interference if it did occur. I-F pickup is parently non-existent. In the writer's mo only 2 or 3 weak birdies can be found— above 51 mc—which is not bad consider the large number of VHF services operat in the Greater Boston area.

The writer wishes to thank Mr. Henry Cross, W1OOP, for his many helpful sugg tions in the design of this converter.



Two Meter Demon

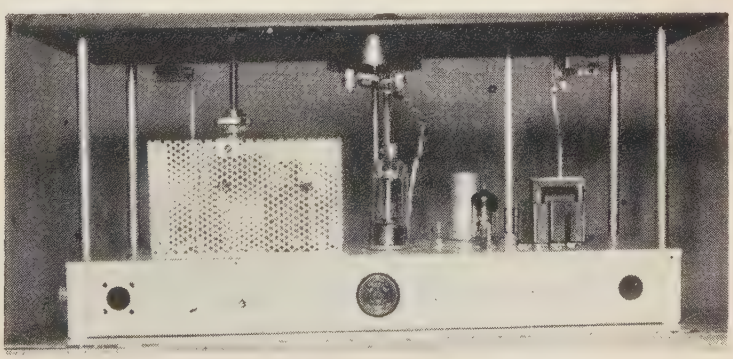
Al Hays W5JQU
ll Bonnell W5CVW
20 Hamilton Drive
Worth, Tex.

Here is an exciter utilizing but three tubes at will fit both the finances and the final. ess power supply, thirty dollars will cover all rts including meter and chassis. As a driver will do for any kilowatt final you have in ind; or as a transmitter in the 90 to 100 watt nge it will be hard to beat. It will easily ive a pair of 4-125A's, or even a pair of 26's to their maximum input. Circuit-wise it simple and is a demon for power output. ne pictures show quite clearly the placement parts and wiring so a step-by-step descrip-on is deemed unnecessary. The chassis shown 7" x 17" x 2" but a smaller one could be ed where space is at a premium.

Blocked grid keying is employed in the E26 tripler plus cutoff bias for the 829B nich provides smooth, click-free CW keying. The Oscillator employs the Robert Dollar rcuit. The 12AZ7 was chosen over a 12AT7 the most efficient of the two. The first triode section acts as a tripler, the second section as a doubler. XR-50 slug tuned coil forms were used in these sections to give broad tuning. Once set they can be forgotten for a 600 kc frequency change. The oscillator section will give 1 to 1.2 grid mils of drive to the grid of the doubler section when the oscillator tripler section is peaked to resonance. The same amount of drive will show at the grid of the 2E26 tripler. Grid current on the 829B will run from 6 to 8 mils.

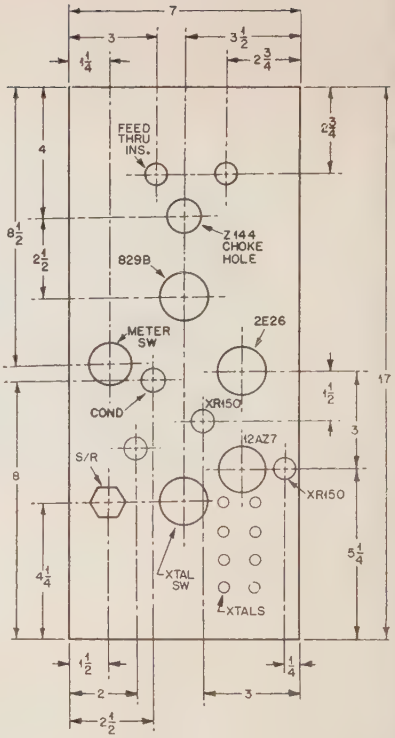
The grid circuit of the 829B is untuned but resonates with the series-tuned 2E26 plate tank. Tuning here is quite sharp but when once set will not need retuning over a frequency change of 600 kilocycles.

The plate tank of 829B is quite different from the average VHF tank, being made from silver plated #10 soft drawn copper wire bent to form a rectangle measuring 3" high and 1¾" wide. It would be wise to grid dip this



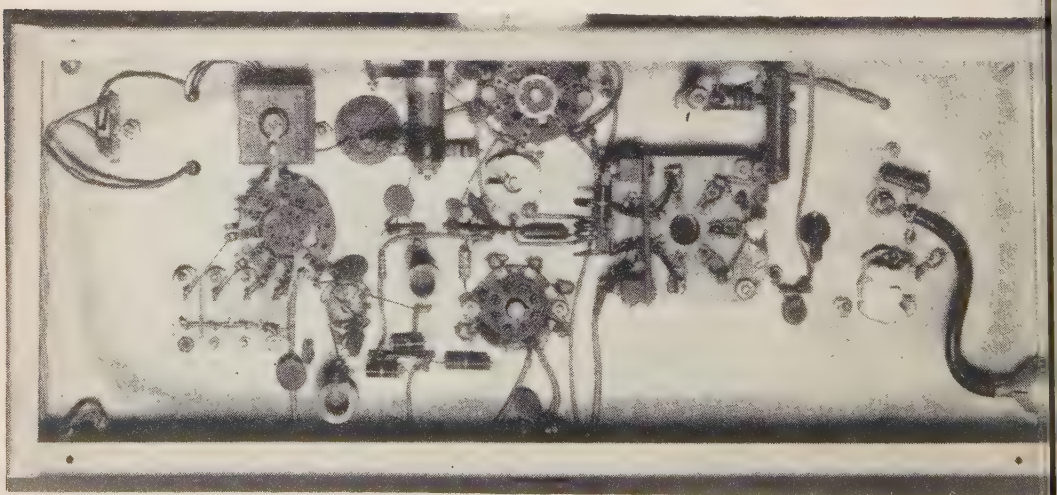
tank and prune the coil to give at least ¾ meshing of the plates of the tank condenser at 144 mc. The shielding around the tube and coil did not appreciably change the frequency of the tank. A BFC-12 (butterfly) condenser is used to tune the square tank. This condenser is a must for this circuit since its construction lends symmetry to the tank and plate leads. The condenser was ordered from *Hammarlund* at a cost of about $1.80. The output link is made from the same size wire bent to form a "U" shaped coil 2¼" high and 1" wide and spaced 1" from the tank coil. Closer coupling is not necessary. One side of this link is tuned to ground through a 3.9-50 μμfd. APC condenser mounted underneath the chassis. Note the loading condenser from the opposite side of this coil to the coax shield. Don't forget it: it is quite necessary. Tuning of this link really puts the grid mils into the final, a secret weapon, more or less! The silver plated wire is well worth while, too. Once tuned, this link need not be touched over a very wide frequency range.

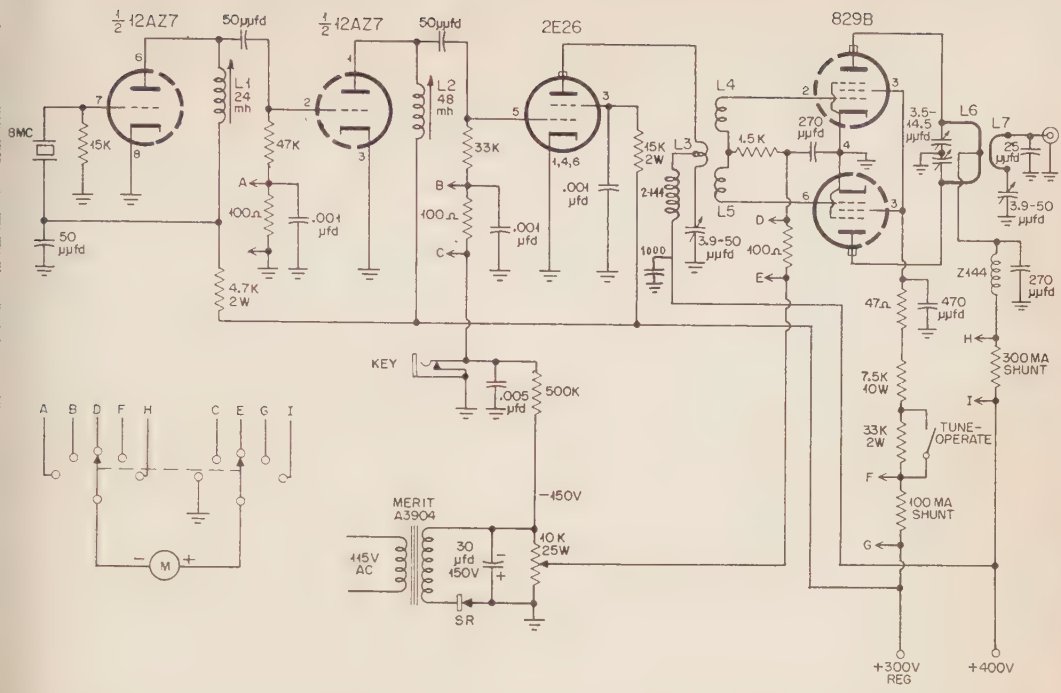
The 829B tube is shielded with a piece of copper bent to form a rectangle 2¾" wide, 3¼" high, 5¾" long, with the sides drilled or punched out to provide circulation of air around the tube. The top of this shield is left open. The butterfly condenser is mounted flush with the top by means of a copper strap drilled at its center to take the condenser shaft. The rotor is grounded to this strap with a small piece of copper shim stock. Be sure to ground the rotor in this manner to keep the 829B from taking off. Otherwise it needs no external neutralizing. The plate tank is soldered to and supported by the lugs on one side of the butterfly condenser. Plate leads to the tube are soldered to the opposite lugs of the condenser. The entire shield, condenser and tank is then bolted to the chassis. Plate voltage is fed at the center of the bottom portion of the "U" shaped tank through a Z-144 choke. A hole is drilled in the chassis, large enough to



give adequate clearance to this choke. T other end of the choke is supported und neath the chassis with a tie point lug.

Plate voltage for the 2E26 is obtain through a dropping resistor from the 82 plate supply. 400V on the 2E26 plate will p duce 6-8 grid mils on the 829B. When used a driver the 829B plate current will be a proximately 150 mils. Keying is performed providing 130 volts of bias to the grid of 2E26 and 30 volts bias to the 829B. A Me A2904 transformer supplies this bias, rectif by a selenium rectifier and filtered by a 30 μ 150V condenser. The 10,000 ohm 25 w





istor provides both the keying and bias voltages required. This bias pack can be placed nder the chassis in any convenient spot.

Metering of the various stages is made available with either pin jacks or meter switching. Your choice here. As shown in the diagram, metering is accomplished at the grid of the econd section of the 12AZ7, grid of the 2E26 nd grid, screen and plate of the 829B.

Tuning procedure is very simple. With tubes nd crystal in place, filaments warmed up, urn high voltage on, key down, check grid current to the second grid of the 12AZ7 for -1.2 mils. Adjust slug of first XR-50 coil to btain this drive, being careful not to "pull" he crystal at resonance. Back off a little when he crystal begins to pull. Then check 2E26 grid current for 1-1.2 mils by adjusting the XR-50 slug in the 12AZ7 doubler section. Next check 829B grid current by tuning the series-uned plate coil of the 2E26. Be careful here s tuning is quite sharp. Once set however, it vill need no retuning over a 600 kc frequency change. Resonate the 829B plate tank, being ure the output link has been connected to a uitable load, such as a lamp bulb or your inal amp. Finally, adjust the output link tuning condenser for maximum output and you are n business with ample drive for that KW or nice 90-100 watts input as a low-powered ig. The 829B runs nicely with plate voltages p to 650. However, 400-500 volts will be sufficient when the rig is used as an exciter.

A word about the power supply. A 300 volt egulated supply should be used to power the scillator plate and the screen of the 2E26. his supply is regulated with a pair of VR-150 tubes in series. The starting resistor value for these tubes is 300 ohms 10w. Unless regulated voltage is supplied to the oscillator there will be a noticeable chirp to the keyed signal, caused by a drop in the power supply voltage when the transmitter takes load, and a resultant change in the oscillator feed-back voltage. The regulated supply eliminated the chirp entirely. A separate 400-500 volt plate supply should be used for the 2E26 and 829B. Certainly this exciter can take on many shapes and sizes since placement of parts is not too critical. We hope the layout shown will suit your fancy since some amount of planning went into the placing of parts to give the shortest leads and direct grounds possible. May the little Demon excite your final to the legal limit. We hope it will do the job for you it has here.

Parts List

L1—16T. #20 enameled on ⅜" dia. slug tuned form.
L2—7T. #20 enameled on ⅜" slug tuned form.
L3—5T. #12 bare copper, ½" dia., spaced ½ dia. of wire.
L4, L5—1T. each, #12 bare copper, ½" dia., wound at ends of L3.
L6, L7—See text.

The hole in the panel to the right of the plate tuning condenser was made to tune the output link condenser with a TV type plastic tuning wand. Also beneath the milliammeter is another hole to provide tuning for the 2E26 plate 829B grid coils. The tuning wand is shown inserted here in the picture.

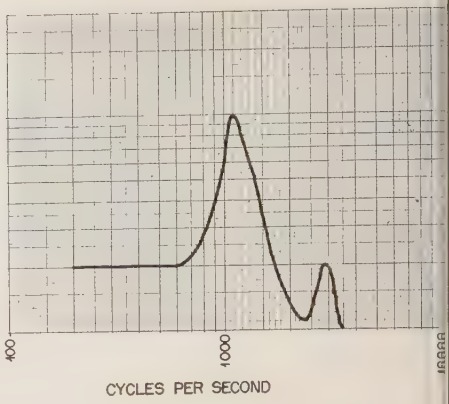
The excellent pictures of the rig were made by Bob Bain, W5CRK.

The exciter has been on the air for the past six months and no bugs have developed so far. In fact it seldom needs any retuning, proving that it is indeed a stable little rig. ■

Inexpensive Audio-Frequency Selectivity

With few exceptions, owners of all but the most expensive communications receivers have felt the need of additional selectivity for the reception of radiotelegraph signals through interference. One approach to the solution to this problem has been the application of band-pass filters designed for the passage of 1020-cps Low Frequency Radio Range signal while rejecting voice-frequency signals. These filters are quite effective . . . . if the input and the output impedances are those with which the unit was designed to function. Other impedances cause a drastic reduction in the filtering action.

Another approach, and one less subject to the vagaries of impedance mismatch, is the use of peaked-response headphones. It is not generally known, but the military forces made considerable use of such devices, and many are available on the surplus market at very reasonable cost. Of course, the problem, as always, is in knowing what type to select. The accompanying figure shows the response curve for Hea P-16 and for Units R-2, R-2A, R-3, R-13, R and R-15. Note how nearly it approaches ideal. CARL DRUMELLER, W5E



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how much Real RF?

Down through the years I have become increasingly frustrated and annoyed by the method of reporting amateur transmitter power. Here is a typical example of the present system:

A station contacted on the 75 meter band reports, among other things, that he is running 100 watts to a voltage-fed Hertz. His signal strength at my station is S7. Another station in the same town and with the same type of antenna breaks in and also reports that he is running 100 watts—but his signal strength is over S9. It is possible that one has a much better location than the other, but the discrepancy in signal strengths happens too often to make this the logical answer.

Let us examine the problem a little more closely. When a station says that he is running 100 watts input, what he actually means is that the voltage on the plate of his P.A. stage is, say, 1000 volts, and the plate mils are 100. This is absolutely meaningless in terms of power *output*. As a concrete case, take my own transmitter on 75 meters. When all stages are tuned right on the nose, it shows a power input to the final of 50 watts. If I remove the grid drive to the final the power input jumps up to 60 watts, but not an ounce of r.f. gets into the antenna. Hence it is possible to any value of r.f. into the antenna, from z to maximum, depending on the amount of drive to the final, the plate efficiency, *Q* of coils, efficiency of feed line, matching of tenna, etc.

It is granted that equipment for the ac measurement of power output is beyond me of the average amateur, but there is a sim method. In almost every case the final c transmitter is first resonated without an tenna, loop, or line being connected, by ping the plate current meter to as low a va as possible. This reading should be no and is called *X*. Then the antenna is cou to the final and further adjustments are m to the antenna coupler, pi-network, matchi etc. The new reading is then noted on the p milliammeter and is called *Y*. When *X* is s tracted from *Y* and multiplied by the p voltage of the final, we have the watt-po which is leaving the plate circuit. True, it m be going only into the transmission line, pa into the line and partly into the antenna, only into the coupler, but at least it is *r.f* go *somewhere*. Hence, the efficiency, or lack it, in the antenna system, which includes coupling to the final plate, will be shown the reports received from other stations. If apparent power output is high and the sig reports are low, then it can be safely assur that the power is not leaving the antenna, is being dissipated somewhere along the l which should call for a re-examination of whole antenna system.

H. H. GLOSTER, VE

PROPAGATION CHART: July

George Jacobs W3ASK

Last Minute Forecast

Short wave propagation conditions are expected to be good throughout the month of July except during the periods of July 9-10, 17-18, and 22-23, when moderate disturbances are likely to occur.

ALL TIMES IN EST

EASTERN USA TO:	10 Meters	15 Meters	20 Meters	40/80 Meters
Western Europe	1300-1600 (1)	0700-1100 (1) 1100-1400 (2) 1400-1800 (4) 1800-2000 (2)	2200-0200 (2) 0200-0800 (3) 0800-1200 (1) 1200-1500 (2) 1500-2200 (4)	1800-2000 (2) 2000-0100 (3) 2100-2300 (2)*
Southern Europe & North Africa	1400-1800 (2)	0700-1300 (3) 1300-1800 (4) 1800-1930 (2)	0400-0700 (3) 0700-1300 (2) 1300-1600 (3) 1600-2200 (4) 2200-0300 (2)	1800-2030 (3) 2100-2300 (4) 2300-0200 (2) 2100-0100 (2)*
Near & Middle East	NIL	0700-1100 (1) 1100-1300 (2) 1300-1700 (3)	0300-0600 (2) 1300-1600 (2) 1600-2200 (4) 2200-0000 (2)	1900-2300 (2) 2000-2200 (1)*
Central & South Africa	1500-2100 (2)	1200-1400 (1) 1400-1600 (2) 1600-2000 (4) 2000-2200 (2)	1400-1600 (1) 1600-1800 (3) 1800-2300 (4) 2300-0300 (3)	2100-0000 (3) 2200-2200 (2)*
South America	0600-1100 (1) 1100-1500 (2) 1500-1800 (3) 1800-2000 (2)	0500-0900 (3) 0900-1500 (2) 1500-1700 (3) 1700-2000 (4) 2000-0200 (2)	0100-0600 (3) 0600-1600 (2) 1600-1800 (3) 1800-0100 (5)	1900-2200 (2) 2200-0500 (3) 2000-0400 (2)*
South East Asia	NIL	1500-1700 (1) 1700-2100 (2) 0600-0830 (1)	0530-0900 (2) 1700-2100 (1) 2100-0100 (2)	NIL
Australasia	1900-2200 (1)	0700-0900 (1) 1600-1900 (1) 1900-2200 (3) 2200-2330 (1) 2200-2330 (1)	0200-0600 (2) 0600-0800 (4) 0800-0930 (2) 1800-2200 (2) 2200-0200 (4)	0200-0630 (2) 0300-0500 (1)*
Guam & Pacific	NIL	1700-1900 (1) 1900-2300 (2)	0000-0200 (3) 0200-0600 (1) 0600-0830 (2) 2200-0000 (2)	0000-0200 (1)
Japan & Far East	NIL	1630-2130 (2)	0200-0600 (1) 0600-0800 (3) 1800-2100 (2) 2100-0200 (3)	2300-0200 (1)
Greenland	NIL	1100-1400 (1) 1400-1900 (3) 1900-2100 (2)	0600-1500 (2) 1500-2100 (3) 2100-0600 (2)	1900-0300 (2) 0300-0500 (1) 2200-0100 (1)*

ALL TIMES IN CST

CENTRAL USA TO:	10 Meters	15 Meters	20 Meters	40/80 Meters
Western Europe	NIL	0700-1000 (1) 1000-1400 (2) 1400-1730 (3) 1730-1930 (2)	2100-0000 (3) 0000-0600 (2) 0600-1300 (1) 1300-1600 (2) 1600-2100 (4)	1800-0100 (2) 1930-0000 (1)*
Southern Europe & North Africa	1200-1600 (1)	0700-1200 (2) 1200-1700 (4) 1700-2000 (2)	2300-0300 (2) 0300-0500 (3) 0500-1400 (1) 1400-2100 (4) 2100-2300 (3)	1900-0100 (3) 2000-0000 (2)*
Antarctica	1500-1700 (2)	1200-1500 (2) 1500-1730 (3)	1000-1200 (1) 1700-1900 (3) 1900-2130 (2) 0100-0400 (1)	2200-0500 (2) 2300-0400 (1)*
Central America & Northern S. America	1000-1300 (2) 1300-1800 (4) 1800-2000 (2)	0600-0900 (4) 0900-1400 (3) 1400-1600 (4) 1600-2000 (5) 2000-0600 (3)	0300-0600 (3) 0600-0900 (4) 0900-1400 (3) 1400-1700 (4) 1700-0300 (5)	1800-2200 (2) 2200-0400 (4) 0400-0630 (2) 1930-0300 (2)*
South America	0900-1200 (2) 1200-1600 (4) 1600-2000 (3)	0600-0900 (4) 0900-1400 (3) 1400-1600 (4) 1600-2200 (5) 2200-0600 (3)	0200-0800 (3) 0800-1400 (1) 1400-1600 (3) 1600-0200 (5)	1900-0400 (3) 0400-0630 (2) 2030-0300 (2)*
Japan & Far East	NIL	1600-1800 (2) 1800-2200 (3)	0600-0900 (2) 1600-1900 (2) 1900-0200 (3) 0200-0600 (1)	0200-0600 (1)
South East Asia	NIL	1600-2200 (3)	0600-0900 (2) 1700-0000 (2)	NIL
Hawaii	1700-2200 (2)	1000-1400 (2) 1400-1700 (3) 1700-2200 (4) 2200-0100 (2)	0100-0300 (3) 0300-0700 (2) 0700-1000 (3) 1000-1600 (2) 1600-0100 (5)	2230-0700 (4) 2330-0600 (3)*
Australasia	1700-2200 (2)	1600-1800 (2) 1800-2200 (3) 2200-0000 (2) 0630-0900 (1)	0200-0400 (2) 0400-1000 (3) 1800-2200 (2) 2200-0200 (4)	0100-0700 (3) 0200-0600 (2)*

ALL TIMES IN PST

WESTERN USA TO:	10 Meters	15 Meters	20 Meters	40/80 Meters
Europe & North Africa	NIL	0900-1300 (1) 1300-1500 (3) 1500-1800 (1)	1400-1700 (1) 1700-1900 (2) 1900-2200 (3) 2200-0000 (1)	1800-2100 (1) 1830-2030 (1)*
Central & South Africa	NIL	2100-0000 (2) 1000-1400 (2) 1400-1800 (3)	1400-1600 (2) 1600-1900 (3) 1900-2100 (2) 2100-0000 (3)	1800-2200 (2) 1900-2100 (1)*
South America	0800-1200 (3) 1200-1800 (4) 1800-2000 (2)	0500-0700 (3) 0700-1200 (2) 1200-1600 (4) 1600-2000 (5) 2000-0200 (3)	0000-0500 (3) 0500-0800 (2) 0800-1300 (1) 1300-1600 (2) 1600-0000 (5)	1800-2100 (2) 2100-0300 (3) 0300-0600 (2) 2000-0100 (2)*
Guam & Mariana Islands	1400-1800 (2) 1800-2200 (3)	0800-1200 (3) 1200-1900 (2) 1900-2200 (3)	0600-1000 (4) 1000-1200 (2) 1200-2000 (1) 2000-2200 (2) 2200-0600 (3)	0000-0600 (3) 0100-0400 (2)*
Australasia	1200-1500 (2) 1500-1700 (3) 1700-1900 (4) 1900-2100 (2)	1100-1400 (2) 1400-1800 (1) 1800-2000 (3) 2000-2300 (4) 2300-0200 (2)	0000-0400 (4)VK 0400-1100 (1) 1100-1300 (2) 1800-2100 (2) 2100-0000 (4)ZL	0200-0600 (3) 2300-0400 (2)*
Japan, Okinawa & Far East	1200-1600 (1) 2000-0000 (2)	0000-0200 (2) 0700-1200 (3) 1200-1900 (2) 1900-0000 (4)	2200-0400 (4) 0400-0600 (3) 0600-0800 (4) 0800-1000 (3) 1000-2200 (2)	0100-0400 (2) 0200-0330 (1)*
Philippine Islands & East Indies	0900-1100 (1) 1400-1900 (1) 1900-2300 (2)	0800-1100 (3) 1100-1500 (2) 2100-2300 (1) 2300-0200 (2)	2300-0200 (1) 0200-0600 (2) 0600-0900 (3) 0900-1200 (1)	0400-0600 (1)
Malaya & South East Asia	0900-1400 (2) 1400-1800 (1) 1800-2300 (2)	0700-1400 (3) 1400-2200 (1) 2200-0200 (2)	0000-0200 (1) 0200-0600 (2) 0600-0800 (3) 0800-1300 (2)	0400-0700 (1)
Hong Kong, Macao & Formosa	1200-1800 (1) 1800-2200 (2)	0700-1000 (4) 1000-1500 (3) 1500-2100 (1) 2100-0200 (3)	0000-0300 (2) 0300-0600 (4) 0600-1200 (2) 1200-1400 (1)	0100-0600 (2) 0300-0500 (1)*

CQ PROPAGATION CHART (SHORT-SKIP)

BAND (METERS)	DISTANCE (MILES) 50-250	250-750	750-1300	1300-2400
10	NIL	0800-1200 (2) 1200-2000 (1)	2000-0900 (1) 0900-1200 (4) 1200-2000 (2)	0900-1200 (2) 1200-0900 (1)
15	NIL	0600-1200 (3) 1200-2000 (2)	2000-0600 (2) 0600-1600 (4) 1200-2000 (3)	0900-1400 (3) 1400-2300 (4) 2300-0900 (1)
20	NIL	0500-1000 (3) 1000-1500 (4) 1500-2200 (3) 2200-0500 (2)	0800-1600 (4) 1600-2200 (5) 2200-0800 (2)	0700-0900 (4) 0900-1500 (3) 1500-0000 (5) 0000-0700 (3)
40	0600-1000 (3) 1000-2000 (5) 2000-2200 (4) 2200-0100 (2)	0000-0500 (4) 0500-0800 (5) 0800-1200 (4) 1200-1700 (3) 1700-0000 (5)	0200-0800 (4) 0800-1000 (3) 1000-1700 (1) 1700-1900 (3) 1900-0200 (5)	0600-0800 (3) 1800-2000 (3) 2000-0600 (4)
80	0500-1100 (5) 1100-1800 (3) 1800-0000 (5) 0000-0500 (4)	0600-0800 (4) 0800-1800 (1) 1800-2000 (3) 2000-0600 (5)	0500-0700 (2) 2000-2200 (2) 2200-0500 (5)	0400-0600 (2) 2000-2200 (2) 2200-0400 (4)
160	1700-2100 (4) 2100-0600 (5) 0600-0900 (4)	1900-2100 (2) 2100-0500 (4) 0500-0700 (2)	2100-0400 (3)	2200-0400 (2)

SYMBOLS FOR NUMBER OF DAYS CIRCUIT PREDICTED TO OPEN:

(1) 1-4 days (2) 5-11 days (3) 12-18 days (4) 19-26 days (5) over 26 days

* Indicates time of possible 80-meter openings.

The CQ Propagation Charts are based upon a CW radiated power of 150 watts and are centered on Washington, D. C., St. Louis, Mo., and Sacramento, California. These forecasts are calculated from basic ionospheric data published by the CRPL of the National Bureau of Standards and are valid through August 15, 1956. The "Short Skip" Charts are based upon a radiated power of 75 watts and times are indicated in Local Standard Time. All forecasts are based upon a predicted smoothed sunspot number of 120 centered on July, 1956. The Swiss Federal Observatory reports that the monthly Zurich sunspot number observed during April was 105, resulting in a provisional 12-month smoothed sunspot number of 68 centered on October, 1955.

Results: 7th Annual YL-OM Contest

Louisa B. Sando, W5R
Jicarilla Apache School
Dulce, New Mexico

Congratulations to W4HLF, Arlie Hager, for again making the highest aggregate score for YLs in the YL-OM contest held in March. In the phone section Arlie made 26,880. points working 336 contacts in 64 sections. On CW she made 15,936.25 points working 209 contacts in 61 sections. Total score: 42,816.25. This is the third time win for Arlie and she now gains permanent possession of the big silver cup donated by W1BFT.

For the OMs, K2DSW, Robert Panek, placed high in aggregate score. On phone he made 1,292.50 points with 47 contacts in 22 sections. On CW he made 2,058.75 points with 61 contacts in 27 sections. Total score: 3,351.25. YLRL Vice President W9YBC, Gloria, informs us that the former OM aggregate score gold cup has been retired by default. In place of it YLRL as purchased a silver cup which will be awarded to K2DSW on a permanent basis.

Highest Phone Awards

1st YL phone–W1SCS, Ruthe Ferguson–30,622.
2nd YL phone–K5BNQ, Doris Anderson–29,050.
3rd YL phone–W4CWV/LKM, Annette Thompson–27,710.
1st OM phone–W9CMC, Rodney Starkweather–1,715.
2nd OM phone–W6FGJ, Edmund Nies–1,462.5
W8AJW, Jack Siringer–1,462.5
(A tie. W8AJW retires this cup on a three-time win. Another cup will be purchased and awarded to W6FGJ.)
3rd OM phone–W6JVA, Richard Maringer–1,100.

Highest CW Awards

1st YL CW–W4BLR, Kay Anderson–17,272.5
2nd YL CW–W3YTM, Mildred Wright–15,000.
3rd YL CW–VE3AJR, Dell Daykin–14,082.5
1st OM CW–K2KDW, Everett Oren–1,750.
2nd OM CW–W3MAX, Dick Houston–1,725.
3rd OM CW–W9BZW, George Hanus–1,687.5
W9GOC/SZR, Alfred Laun–1,687.5

W9YBC comments that she received 59 YL phone logs and 65 YL CW logs, though logs indicated that 279 YLs participated in the contest. From the OMs she received 90 phone logs and 130 CW logs. Here are the rest of the scores:

YL Phone

W1CEW	4,060.	K2CUQ	617.5	W3MDJ	10,500.
W1QON	975.	K2GCD	1,331.25	W3MSU	96.25
W1RLQ	1,820.	*K2LTN*	1,569.	W3UTR	3,375.
W1SCS	30,622.	W2OWL	142.5	W3VVN	12,350.
W1VXC	1,211.25			W3YTM	7,650.
W1VYH	224.	*W3MAX/OQF*	14,962.5		
W1YNI	2,840.			*W4CWV/LKM*	27,710.

W4GBT	(conf.)	W6QGX	21,902.	W9LOY	3,07
W4HLF	26,880.	W6QMO	1,312.5	W9SYX	14
W4KYI	25,350.	W6WRT	1,460.	*W9UON*	5,01
W4RLG	2,007.5			W9YBC	(conf
		W7BHZ	12,201.25		
K5BNQ	29,050.	W7CPQ	2,730.	*KØACC*	8,81
W5DRI	10,803.75	W7MUT	3,607.5	KØBFS	8,02
W5EGD	8,872.5	W7TGG	(conf.)	WØFVE	2,10
W5RZJ	40.			WØSZH	8,25
W5SPV	8,878.	W8DNF	(conf.)		
W5WUX	6,550.	W8KLZ	99.	*KG4AC*	10,69
		W8MBI	857.5		
W6EHA	2,420.			*KL7ALZ*	52
K6EXQ	13,781.25	K9AMD	3,045.		
K6HVC	11,015.	W9KSZ	860.	*KP4ZV*	5,29
W6JZA	23,456.25	W9LDK	470.		
W6NAZ	(conf.)			KZ5VR	9,03

YL CW

W1BBS	343.75	K2DKL	(conf.)	*W4BLR*	17,27
W1FTT	(conf.)	K2DSL	1,137.5	W4CCN	
W1RLQ	11,300.	*W2EBW*	5,580.	W4EJQ	9,04
W1VOE	(conf.)	K2INQ	280.	W4GBT	(conf
W1VXC	4,578.75	W2MWY	4,488.	W4HLF	15,93
W1WPX	4,720.			W4KYI	11,16
W1YNI	4,312.5	W3NHI	368.	W4RLG	9,32
W1YPH	5,760.	W3QPJ	9,897.5	W4TIE	10
W1YYR	7,315.	W3TSC	3,936.	W3ARK	1,53
		W3UTR	4,717.5	W3AXT	85
W2BNC	(conf.)	W3VNN	7,393.75	W3BIP	58
K2CUQ	(conf.)	*W3YTM*	15,000.	W3CIN	90
K2DXD	3,000.				

[*Continued on page 116*]

"My transmitter is all right! It's that durned 15 Megacycle I.F. you got!"

SSB

Bob Adams, K2DW
245 Revere Road
Roslyn Heights, New York

We hope you enjoyed the first Single Sideband column in the June issue. We will continue to report news of interest about SSB, together with photographs of outstanding stations and operators.

Ron, G6LX will conduct a column in Short Wave Magazine entitled "SSB Topics," which indicates the popularity of SSB in Great Britain. Activity on the higher frequency bands is increasing rapidly now that conditions have improved. European stations are heard in the U. S. A. all evening long. Australian and New Zealand signals sound like locals on the East Coast from 2200 until 0900 EST. Fifteen is becoming a very popular band for SSB and is the best bet for a six continent roundable. Seventy-five is still popular for short haul round-tables and for the nightly meeting of the "Klan."

Twenty Meters

KC4USA at the South Pole continues to run hundreds of successful phone patches. KC4USV is also active and his first phone contact from Ross Island was with WØURU. GW3EHN, Oscar is expecting his SSB exciter and hopes to be the first SSB in Wales. OH2OJ, Sam is putting a big signal into the U. S. A. from Helsinki. F9HF, Peter is on SSB in Paris. I1BAO, Peter has a new final with parallel 4-125 A's. SM5OH is very active in Sweden, as is SM5FA. KP4AAO and KP4ES are keeping Puerto Rico well represented. 5A2TP went SSB in Libya and is giving the boys a new country. DL3JM, Werner went to 20 with a crystal filter and 813 final, after several years on 75. He reports other German Nationals are building exciters and will soon be on the air. DL4MQ has a new exciter and is getting a big kick out of SSB. VK4AB, Ramsey told your conductor that he has made many W contacts on SSB with 1½ watts input. ZS6AIY, Len has his new linear perking and has enjoyed many fine contacts. Empty, ZS6KD reports considerable activity in South Africa. There are ten stations active in Johannesburg and several new ones almost ready to go. ZS3E is on most every evening from 1630-1900 GMT. KX6BB, in the Marshall Islands is heard nightly around 0830 GMT. ZL3PJ has been working many G stations. CE2HV has a new kilowatt. HC2PP has been working into the States.

Fifteen Meters

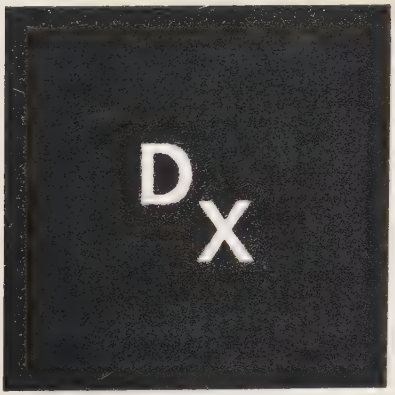
Ted, G3GKF has been scheduling W4NQN, W9RUK, WØDRD, and KH6AR daily on 21245 kc at 1830 GMT. G2ALM, G3BFP, G3BXI, G3HJK and G6LX have taken part in these tests. Jimmy, CX5AF is very active most evenings and is being hotly chased by those who still need South America for a Sideband WAC. CE2HV has worked DL5YU; W4DGW/MM, Earl on the SS Del Campo off the coast of South America has been working into Europe. VS6DA made a brief appearance, using a low power phasing ring.

Ten Meters

G6LX reports ZS6OY, W1CLS and WØCXX have been heard during periods when the ten meter band has been dead for AM. Many DX stations are known to be building new VFO's and high level mixers.

We trust that you will forward, to the writer, any information which you believe will be of interest to the readers of this column. We would also like to have photographs of SSB stations and operators, as well as unusual QSL cards.

73, Bob, K2DW



Gathered and reported by
R. C. "Dick" Spenceley, KV4AA
Box 403, St. Thomas, Virgin Islands

YASME QSL Cards via KV4AA

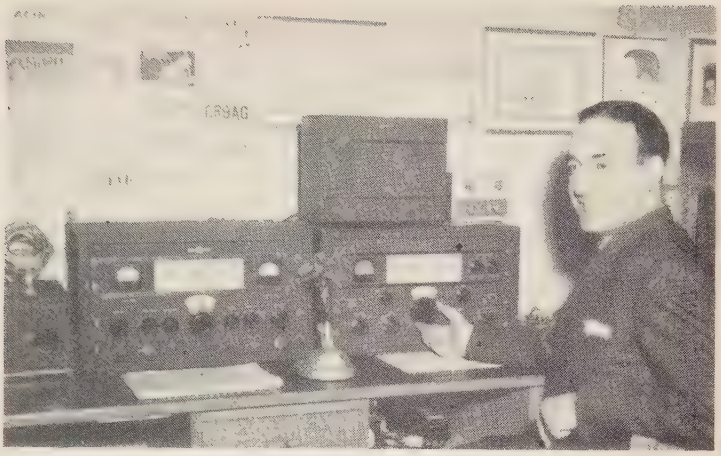
In an effort to provide the YASME with a new set of sails and additional gear, an item appeared in the DX column, May *CQ*, requesting that a dollar contribution accompany each QSL for Danny. This would result in a prompt return VR1B QSL via airmail. Subsequently this was amended in a form letter to all contacting stations (W, K, VE and U. S. possessions) who did not enclose a dollar. This letter read in part "should you be one who feels that contributions should not be made as a matter of principle or for financial reasons, we can promise you a card, via bureau, when the trip is over in some two years' time." I believe the vast majority of DX'ers understand that our motives in this direction were only to keep this very interesting trip on a going basis so that the appearance of Danny would be guaranteed from many other rare spots.

On the other hand, a few complaints have been received of a mild nature with one "hot" one hinting that Danny and myself are getting rich off the deal which will ultimately lead to the corruption and downfall of Ham Radio, if not to its complete demise.

In an effort to strike a happy medium, which, it is hoped, will be acceptable to all, the following QSL procedure will be adopted for all YASME stops after VR1B. Contributions of a dollar or more are requested. This will result in a direct airmailed QSL to the station contacted with the arrival of his card and consistent with the arrival of Danny's logs (we shall endeavor to provide rapid QSL service by obtaining logs via radio contact). Other stations contacting him and submitting QSL will receive Danny's card via bureau within a reasonable period of time. Such cards should be dispatched within six months of the receipt of contactee's card which is, more or less, a normal time lapse in comparative expeditions.

Last Minute Items

A new station, FB8BI, is located on Juan de N Island about 100 miles west of Madagascar in Mozambique Channel. It is manned by two V boys, Pierre on CW and Jean on phone. The C is T7 on CW and we understand that Jean is more rabid ham. It is not known if this spot w be a separate country (from Madagascar). TH should be there about a year . . . The Finn S.A.R.L. has taken steps in hopes that Aala Island will be given separate status . . . K4AM KS4 is active on Swan Island. QSL's go Tampa, Fla . . . ZD8SC has been skedding W6S Tuesdays at 2200 GMT, 21155 kc . . . W2E hopes to be on with a FP8 call between Aug 6th and 20th . . . FE8AE (ex-FF8AN) has be active from French Togoland 1900 to 2100 GM 14075. QSL's go to Marcel Veber, Box 408, D ala . . . K6JQJ advises CR1ØAA's cards should to: Ruy Trinidade, c/o P.O. Dili, Portugu Timor . . . FB8BK should be heard from t Glorieuse Isles shortly . . . YN1CAA has be very active on 14090 around 1200 GMT. Q via U. S. Embassy, Managua . . . Via VQ4AQ learn that a DX trip is planned by some VQ4 b which will take them to VQ1, VQ9, VQ7, t Amirante Group and other islands. A gas genera and 100 watt rig will be used . . . DL3SZ advis that IT1ZGY will be on from the Pelagric Islan (Good for W.A.E.) from June 15th to 22nd . VQ3CF will spend a year in England and th return to VQ4-land . . . OK1MB (via K6JQ says that the Russians CAN contact the USA b the news hasn't gotten around to them yet! . All former OE13 stations can obtain their QS by writing: Signal Section. Headquarters SETA APO 168, N.Y. . . . DL1CR, DL3AO, DL9 and DJ1BP will spend a week in Luxembou August 5th or August 12th. They will be on C exclusively 3.5 thru 28 Mcs . . . CE3AG advis that CEØAD has been active on CW on sever freqs. between 14000 and 14100. The ca CEØAC, has also been used. Cards go via C Bureau . . . Two local hams in Dutch St. Mart will have their transmitters on the air should th be successful in obtaining their licenses. Examin tions were due on or about June 7th.



HB9J, Jean Lips, was the recent recipient of WAZ No. 321

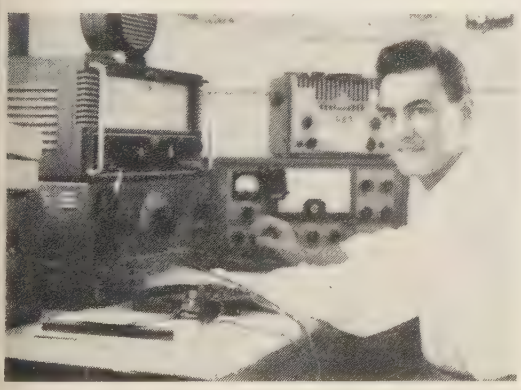
Our heartiest congratulations to the following stations upon their achievement of WAZ:

No. 320 HENRY B. VAN VOORST
W9HUZ 40-237

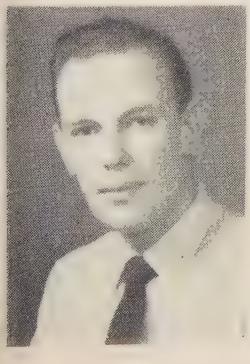
No. 321 JEAN A. LIPS
HB9J 40-228

No. 322 HAROLD E. STRICKER
W8WZ 40-223

Cards from Bob Ford, AC4RF, were responsible for the completion of all the above. HB9J is the first HB to join this select group while W9HUZ is the tenth W9 and W8WZ is the eleventh W8. We also welcome HB9J to the "phone only" group with a score of 36-172.



I5REX, Edi, of Mogadiscio, Somalia.



Nev Jackson, VQ5GC (soon to be VQ9)

. . . . . .

AVES ISLAND EXPEDITION, YVØAA: We are advised by YV5BX that the date for this trip has been pushed ahead due to the availability of government transportation. The group, which includes twelve YV amateurs, will leave Venezuela on the evening of June 12th and are due to arrive at Aves on June 14th. Gear will be set up and YVØAA will participate in a local YV contest which will terminate at noon on June 17th at which time YVØAA will commence general contacts on a continuous basis (24 hours per day) until midnight of June 24th. All band operation is planned on phone and CW. 6 and 2 meters will also be covered. Simultaneous two band operation will take place if QRM difficulties can be overcome satisfactorily. Aves Island is a small 1500 yard long dot in the eastern Caribbean about 100 miles due West of the British island of Dominica. It is steadily decreasing in size as rough seas wash away its coral formation. This Venezuelan possession is a bird sanctuary and, in the Winter months, plays host to millions of birds which blanket the place. There seems no doubt that Aves will qualify as a separate country as it is a considerable distance from Venezuela and in a different hemisphere. QSL's should go via Radio Club Venezolano, Post Office Box 2285, Caracas.

ZANZIBAR, VQ1JO: Mal Geddes, ZE3JO, informs us that he will be active on Zanzibar Island from August 13th to September 4th. VQ1JO will run a British B2 Mark III Transmitter/Receiver with an input of approximately 20 watts. 14 Mcs, CW, will be used exclusively. Mal has already booked boat passage, hotel, etc. and sees no reason why the trip will not take place. 100% QSL'ing is guaranteed upon his return to Southern Rhodesia. ZE3JO is ex-G2SO.

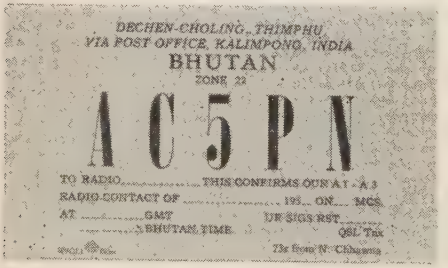
Electronic Love

If she wants a date—	Meter
If she comes to call—	Receiver
If she wants an escort—	Conductor
If she's cheating—	Detector
If she's fat—	Condenser
If she's thin—	Feeder
If she's extravagant—	Limiter
If she's in error—	Rectifier
If her hands are cold—	Heater
If she fumes and sputters—	Insulator
If she's ugly—	Transformer
If she's bossy—	Resistor
If she's slow—	Accelerator
If she's bored—	Exciter
If she refuses—	Rejector

Tks to W3UXX and NavShips 900-100
Mar. '45

SEYCHELLES ISLANDS, VQ9: Neville Jackson, VQ5GC, has finally received a permit to operate at this QTH. He will spend ten days there in late September or early October. To make this trip possible $300 is being sent VQ5GC to defray partial costs. In order that we may be reimburs it is requested that small contributions be f warded in advance or with QSL on an entir voluntary basis. Should amounts in excess of t sum be received they shall be entered in a fu for the purpose of furthering other worthwh DX'peditions. This will replace the dollar-per-Q basis which, tho efficient and relatively painle is felt by some might lead to abuses if c sistently promoted. W and VE QSL's go KV4AA.

AC5PN, Chhawna, says "don't laugh" but these are my working clothes, plus sword and dagger. AC5PN is on Saturdays and Sundays around 1200 GMT, 14090/14052. (25 watts)



A batch of these have gone forward to Chhawna thanks to W9NDA.

SOCCORRO ISLAND, REVILLAG IGEL GROUP, XE4A: Via W9FKC and the West G Bulletin we hear that a group of WØ's were d to appear at this spot, some 500 miles off the W coast of Mexico, on or about June 5th. The c will be XE4A and it is understood that it w qualify as a separate country.

LUXEMBOURG, LX: ON4QX advises that group of ON4's have received their permit a were due to be on from a QTH near Wiltz, Luxe bourg, on June 9th and 10th. Calls used bore t suffix "LUX" ie: ON4QX/LUX, ON4TQ/LU An attempt to obtain a license to operate fro Vatican City, at a later date, is being made this same group.

YASME EXPEDITION, VR1B, etc.: As this read Danny should be on his way to Nauru Isla with a possible short stop at one of the islands the Gilbert and Ellice group. The call at Nau will be VK9TW. I know the DX gang will wa to pass a vote of thanks to Danny for his consi erable efforts in giving most of us a new countr VR1B contacts will probably total over 400 Thanks to contributors and donations of gear fro radio manufacturers the YASME now has enou ham equipment to guarantee his appearance on t air from all stops. Of note is his latest acquiremen an ELDICO 500 watt linear amplifier, to go wi his SSB-100A. Both of these items were given, c a loan basis, through the generosity of Eldico W2UOL. This gear will insure a potent signal a those stops where sufficient local current capaci is available to allow its use. It also heightens th possibility of that first Sideband DXCC! Thos who have followd the YASME stories in CQ wi realize that Danny's major problem stemmed fro the rotten condition of his sails. Through the e forts of W2NSD an entire set of new "ORLON sails should now be adorning the YASME. Whil the manufacturer of these sails generously gave u a half-price deal, the cost of material, making an air-freight was imposing and added up to consider ably more than the odd $1,000.00 contributed, t date, for VR1B QSL's! With the major items o sails and equipment now behind us the expeditio may now be maintained at a much more modes cost. Cards, resulting from VK9TW's activity wil be dispatched by KV4AA promptly, via bureau unless direct QSL is made possible by the enclo sure of a self-addressed stamped envelope. I should be understood that QSL'ing is dependen on the periodic arrivals of VK9TW's logs. Pleas

ontinue your contributions so that this expedition nay continue its success. Danny wishes to express iis sincere thanks to the many who have helped iim and promises to do everything humanly possible to hit *every* rare spot along his way. After he Nauru operation the YASME will proceed to he Solomon Islands, VR4, and then, after a stop t Darwin, Australia, to CR1Ø, VU5, etc.

DX Notes

Four new licenses have been granted in Gibraltar, ZB2Q, ZB2R, ZB2S and ZB2T. QSL's go care of Officers Mess, RAF, New Camp . . . CR1ØAA appears near 14084 daily from 1200 to 1500 GMT with T7/8 signal. The name is Ruy and he says Portuguese Timor but won't give exact QTH . . . UC2AA says QSL via box 547, Sofia, Bulgaria . . . DX'peditions are being planned by W5CFG, W6NJU, W9OWZ, W9ZTD, W9PPS and W2EIK for this Summer. Goals include Swan Island, Navassa Island, Corn Island and the Serrana Bank. Should a state department call be obtained for Corn Island it might qualify for a new one . . . Viet-Nam may soon be legally represented. Should his contract be approved a well-known W3 will go there and run a KW on SSB, CW, etc. A guaranteed ham license is a stipulation of the contract . . . MP4QAL, Qatar, will QRT soon but says that MP4QAP will be active . . . old MP4BAD is now DL2UY . . . F7ER and gang still plan 3A2 trip . . . FB8YY may soon be active from Terre Adelie (Antarctica) . . . W5CFG reports K4AMV/KS4, 4099, 0100 GMT . . . W7PHO now has JZØPS logs. JZØPS can receive mail at this QTH: Kees Andre, Pasudu, PPSS, Makassar, Indonesia (Station location is in Hollandia, New Guinea) . . . YJ1AA is very active, near 14090, at 1130 GMT . . . Via W5FXN we hear that FU8AA now has a good receiver and is on 21 Mcs. Saturdays and Sundays . . . FU8AC is very active on phone 14 and 7 Mcs . . . Via the South Calif. Bulletin we are advised that VK6MK and W6ITH contemplate a trip to ZC3, VQ9, ZS2 or VU5. VK6MK can get the license with allowance for W6ITH to operate. Nothing definite yet . . . Via the West Gulf Bulletin, W5ZZR, reporting on KC4U-Antarctic operation says: All stations will be using KWS-1 transmitters and 75A4 receivers on SSB, AM and CW. At present KC4USA and KC4USV are active. KC4USA is at little America and KC4USV at Mc Murdo Sound. About December, or sooner, KC4USB, Marie Byrd Land, and KC4USN, at the geographical South Pole, will be active. Mail from these stations cannot be received until the ships return in 1957. All QSL's will be answered. Send your cards to: Staff Comm. Officer, Task Force 43, Room 831, Old P. O. Building, 12th and Pennsylvania Ave., N. W. Washington, D. C. . . . FB8BR says that FR7ZA works next door from him. No hope for activity from FR7-land for some time . . . SVØWN, Crete, will be on until November. He prefers the low end of 14 on CW and runs a BC-610 plus Collins RX. Says other Crete stations will appear.

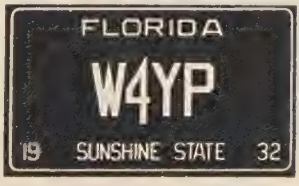
This is a "vacation" column so other features have been omitted this month.

73, Dick, KV4AA

July QSL Contest Winner

Even in black and white OA4AI's card looks good, taking top honors this month, with another Peruvian running a close second. Hmmm . . . another DX winner. What happened to the old U. S. of A. cards?

and runners up...



Lee Waite, W2FBZ, 6 meter top scorer in New Jersey.

SCORES: April VHF Contest

First figure designates number of contacts, second figure the number of counties worked, third figure the total score. Winners in each state are in bold-face type.

144 Mc.

ALABAMA

W4VUO	9	6	54

CALIFORNIA

W6AJF	81	20	1620
W6MLN/6	106	20	2120
W6GYN/6	68	20	1360
K6HYX	15	5	112.5
K6LRN/6	30	9	270
KN6PUR	109	6	654
KN6PKU	115	7	1207.5
W6MFI	52	14	728
K6DTR/6	50	15	750
KN6QZU	**78**	**19**	**2223**
W6HIR	2	2	4
K6EUD	200	7	1400

CONNECTICUT

WN1FBL	13	3	39
WN1FHP	**75**	**16**	**1800**
W1VSI	13	5	97.5
WN1GAV/1	44	10	410
W1ECI	39	7	409.5
W1WHR/1	38	8	304
W1COT	17	7	119
W1FPF/M	21	5	157.5
W1NBP	16	9	216
W1ZIC	55	9	742.5
W1UIZ	34	16	544
W1VSI	73	13	1123.5

DELAWARE

W1JSM/1	1	1	1

FLORIDA

W4WHF	11	3	49.5
KN4EAC	12	4	41

GEORGIA

W4ABP	7	3	21

ILLINOIS

W9AAG	21	19	399
W9CT	44	9	396
WN9YMP	22	4	88
W9FTT	53	8	636
W9QKM	**78**	**32**	**2496**
W9OSQ	14	1	14
W9MHL	56	9	756
W9ADO	19	4	76
W9TKR	23	7	161
W9MYC	61	10	915
W9KCW	14	4	56
W9QKE	60	8	720
KN9APQ	52	8	624
W9ILR/9	15	3	45
KN9BBK	51	12	612
W9ORH	73	14	1022
W9TTI	65	10	650

INDIANA

KN9AQP	**48**	**12**	**864**
W9HVY	40	6	240

IOWA

WØWQQ	**18**	**11**	**198**
WØOLY	19	9	171
WØVMN	7	6	42

KANSAS

WØQDH	5	5	25

KENTUCKY

W4WNH	9	8	72

LOUISIANA

KN5EFS	6	2	18
W5ZSP	**12**	**4**	**66**

MAINE

W1BBB	9	2	27
W1LHA	**13**	**9**	**117**
W1IKW	1	1	1.5

MARYLAND

W3GKP	36	18	648
W3YHI	**71**	**37**	**2627**
W1JSM/M	12	8	96

MASSACHUSETTS

WN1IJQ	97	10	1455
W1CNM	24	8	192
W1QPU	71	10	1065
W1RUD	**134**	**44**	**5896**
W1IHV/M	57	9	513
WN1FMW	40	5	300
W1VXW	66	9	594
W1PSG	60	14	1260
W1VYS	11	4	44
W1AHE	28	7	196
W1AQE	75	17	1175
W1QXE	30	6	180
W1YLV	33	8	264
W1PLX	80	34	2720
W1RFU	36	17	612

MICHIGAN

W8URO	14	4	56
WN8EYJ	30	7	315
W8CVQ	29	15	435
W8DX	**86**	**48**	**4128**
W8BGY	20	4	80
W8GYU	20	4	80
W8JXU	32	6	192
W8ARR	39	18	702
W8PT	24	14	334
W8IPS	7	3	21

MINNESOTA

WØDXY	9	6	54
KNØBNS	1	1	1

MISSOURI

KNØDBQ	20	6	180
KØDOK	**27**	**8**	**216**

NEBRASKA

KNØDFQ	17	4	102
KØBOO	**17**	**4**	**153**
KØBTG/Ø	16	5	80

NEW HAMPSHIRE

W1FZ	5	1	5

NEW JERSEY

W2JSE/2	7	7	49
K2ICE	76	21	2394
W0ETI/2	82	45	3690
W2TBD	62	29	1798
KN2MYQ	51	16	1224
W2AMJ	62	42	2604
K21TP	100	22	3300
K2HOD	52	16	832
K2KFJ	31	11	51
K2DCF	46	17	78
KN2PTJ	35	9	47
K2KED	45	7	31
K2AWY/2	121	27	3267
K2JVX	70	21	1470
W2OIB	**146**	**30**	**4380**
W2RGV	4	4	16
K2LFO	6	2	12
KN2ODO	114	19	3249
W2AQG	36	11	59
KN2RNU	45	11	495
KN2RXW	1	1	1
W2SJB	25	13	325
KN2QXX	81	12	1458
K2BKU/2	95	29	4135
W1JSM/M	5	4	20
W2CXY	23	19	437
W2PWX	83	31	2573

NEW YORK

K2HQI	44	6	396
W2PST/2	23	5	115
W2PST	16	6	96
W2RXG	72	43	3096
W2BLN/2	20	9	180
K2DEM	16	8	192
K2DLM	54	13	1053
KN2ODL	20	7	210
W2WDO	33	9	297
W2WFB	64	32	2048
KN2MXT	62	20	1860
W2FEN	15	4	90
W2NSD	**114**	**46**	**5144**
KN2RHG	12	6	72
KN2MYS	13	7	130
W2CTA	20	6	120
KN2QLT	45	13	585
K2IJX	56	24	1400
K21EJ/2	110	35	3850
W2UIS	20	5	100
K2ERQ	31	12	372
KN2MPY/2	5	2	10
KN2MPY	8	1	12
K2FCG	21	7	147
W2ZPL	52	12	936
KN2RDI	56	10	840
K2EQO	18	9	243

OHIO

W8JOY	34	7	238
W8SFG	73	47	3431
W8NAF	67	22	1474
WN8HXT	53	28	1484
W8LOF	63	31	1953

V8BMO	15	4	60
V8WYU	23	3	103.5
V8BTK	46	29	1334
V8KDW	51	23	1173
V8IFZ	10	6	60
V8DPW	52	12	936
V8ILC	74	21	2331
V8WEN/8	37	17	629
KN8EAQ	29	12	522
W8GZW	96	55	5280
V8LAH	41	23	943
V8IPT	41	8	492

OREGON

V7WTQ	17	10	255
V7UDN	26	9	234
W7SEZ	30	10	300

PENNSYLVANIA

W3TDF	161	50	8050
V3KWH	5	4	20
V2AFJ/3	20	9	270
Vn3CLQ	72	18	1296
V3LXM	38	13	741
V3LHG 3	65	21	1365
V3DEX	30	12	360
V3WHK 3	4	2	8
V3CPT	50	13	975
V3IMW	40	11	440
VN3FTP	100	22	3300
V3HYO	87	12	1566
V3ULB	82	24	1968
V3WIP M	37	17	629
V3DTH	47	12	564
V3ZVK	132	29	5742

SOUTH DAKOTA

WØRSP	7	5	35

RHODE ISLAND

VNIFEO	4	2	8
V1WED	17	5	85
V1FZJ/1	107	35	3745
V1UEF	16	6	144

CANADA

VE3BOW	32	7	224
VE3DIR	56	28	1568
VE3DWW	27	6	162
VE3AIB	58	26	1508
VE3BRO	23	8	184
VE3DXR	35	9	315
VE3BHZ	22	5	110
VE3DUU	20	6	174
VE3DFY	22	5	110
VE3DNE	39	8	312
VE3BGT	13	4	52
VE3DSU	27	17	459
VE7AOG	7	2	14

50 Mc.

ARKANSAS

W5ZVF	1	1	1

CALIFORNIA

K6QQL	39	5	292.5
W6SRE	8	1	8
W6BWG	8	5	40
K6HYW/6	96	14	1338
K6OBO	113	8	904
W6MFI	85	13	1105
K6KUF/6	134	10	1340
W6VWK	85	15	1275
W6ZOP	200	9	1800

COLORADO

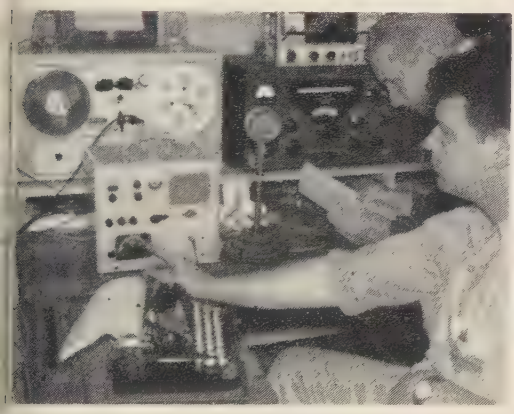
WØFKY	22	16	352

CONNECTICUT

W1LGE	16	8	128

DELAWARE

W3CGV	18	15	270



W3ZVK, second highest scorer in Pa. Rig is a Gonset Communicator, antenna a 5-element beam 20 feet high, QTH is 520 feet above sea level.

TENNESSEE

W4THM/4	22	13	286

VERMONT

W1MMN	16	13	208

VIRGINIA

W4JCJ	40	20	800

WASHINGTON

W3YHI	71	37	2627

WASHINGTON (state)

W7LHL	37	12	444
W7AVM	1	1	1
W7ZOB/7	4	1	4

WISCONSIN

W9ILR	15	3	45

GEORGIA

W4WWQ	2	2	1
W4IKK	7	4	28

ILLINOIS

W9AGG	7	3	21
K9AUN	25	9	337.5
K9AVZ	17	6	102
W9AFP	40	21	840
W9YOI	32	10	320

INDIANA

W9HPO	20	16	480
W9BRN	76	45	3420

IOWA

WØUSQ	30	16	480
WØSMJ	21	17	357
WØWOQ	14	3	42

MAINE

W1DEO	55	32	1760
W1GKJ	11	9	99

MARYLAND

W3OTC	46	30	1380
W3PZK	8	4	32
W3DMS	38	18	1026
W3KMV	37	23	851

MASSACHUSETTS

W1GWP	40	10	400
W1HOY	113	30	3390
W1YPK	79	22	1738
W1LUW	15	5	75
W1HUH	8	4	47
W1OOP	60	19	1140
W1VYS	9	4	36
W1TTG/1	26	12	312
W1WYZ/1	14	37	518
W1DVF	45	12	540
W1IFW	10	4	40
W1CIX	27	9	243
W1PX	30	15	675
W1QXE	17	7	119
W1FOS	125	38	4750
W1RFU	29	18	522
W1LMU	40	5	200
W1GRW	37	15	555
W1CAS	10	6	60

MICHIGAN

W8ESR	32	13	624
W8HJR	36	11	396
W8SSO	30	12	360
W8QLO	14	5	70
W8VYG	16	3	48

MISSOURI

KØDGG	39	12	468
WØODI	44	7	462
WØBPM	27	4	108
WØPXO/0	11	5	55
WØWKG	15	3	45

NEW HAMPSHIRE

W1IQD	2	2	4
W1FZ	16	8	128

NEW JERSEY

W2FBZ	108	33	3564
K20MI	12	5	60
W2RGV	12	7	84
K2AWY/2	77	20	1540
K2LFO	17	7	119
K2BKU/2	47	14	987
W20RA	26	12	312

NEW MEXICO

W5KWP	15	12	180

NEW YORK

K2OIL	59	20	1180
K2ERQ	16	9	144
W2BVU	3	3	9

OHIO

W8QLB	22	7	154
W8SGX	36	22	792
W8MXR	9	3	27
W8PKC	30	16	480
W8SVU	27	14	378
W8IED	14	5	70
W8IFZ	11	3	33
W8IKL	34	18	612
W8INQ	12	7	84

OREGON

W7PGS	11	4	66
W7INX	15	7	105
W7SEZ	11	6	66

PENNSYLVANIA

W3UBO	34	24	816
W3KWH	14	10	140
W3LHG/3	26	14	364
W3UQJ	15	9	202.5
W3YRB	20	11	330
W3AMO	35	14	735
W3KJM	19	14	266
W3TIF	1	1	1

RHODE ISLAND

W1UHE	38	10	380
W1WED	28	10	280
W1WTR	30	12	360
W1CPC	33	11	363

TEXAS

W5FEG	6	7	112
W5BXA	11	8	88

UTAH

W7YDZ	4	3	18
W7QDJ/7	1	1	1

VERMONT

W1WID/1	99	27	2673

VIRGINIA

W4UCH	38	22	836
W4OLO	2	2	4
W4JCJ	16	7	112
W4WIS/4	34	11	374

WASHINGTON (state)

W7FEG	38	9	342
W7LHL	8	3	24
K6AXV/7/M	8	4	32
W7PRW	18	7	126
W7YGI/7	7	2	14

WISCONSIN

W9JFP	47	18	846

220 Mc.

NEW JERSEY

W2RGV	10	7	70
W2DZA	8	6	48
W2BVJ	3	3	9

VERMONT

W1WID/1	3	3	9

MASSACHUSETTS

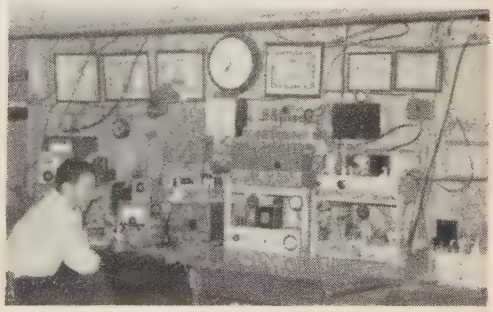
W1RFU	2	2	4

CONNECTICUT

W1LGE	1	1	1

AIRBORNE 144 Mc.

W8UAT/8	75	35	2625
W8PTF/8	65	27	1755
W1GYU/1/2/3	144	42	6048



W2RGV, Top Scorer on 220

V H F

Reported by

Sam Harris, W1FZJ

P. O. Box 2502, Medfield, Mass.

Calling Frequencies

At least a quarter of the letters we receive from you mention the establishment of a national calling frequency on Two Meters and a goodly number of them ask for the same thing for Six. The presently established national calling frequencies for these bands as set forth by our own ARRL (145,350 and 50,550) are probably satisfactory for the purpose for which they were intended, but—and herein lies the rub. . . .

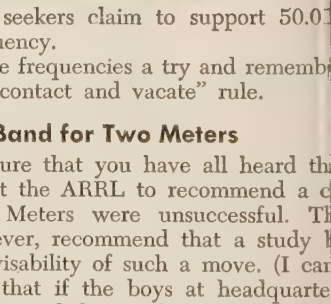
The DX-minded boys want a frequency where they can park their receivers and be assured that when the band is open they will hear some evidence of it. They are not monitoring the band for the purpose of establishing a local contact (the obvious way to do this is to put forth a general call of inquiry).

The ragchewing and mobile boys are looking for a frequency where they can be assured that a call will bring an answer. Obviously these two divergent purposes cannot be served by one frequency.

W2OIB, 2-meter winner in New Jersey. Antenna in a 40-element beam (8 5-el yagis).

The Dayton "R-F Carrier" has suggested th the two-meter band be monitored on 144.990 a 145.080. These frequencies are for the bene of those who are looking for a contact. The VH DX Guild has suggested the use of 144.250 f those high-power, "low end of the band" oper tors who really don't want to talk to anybo but still like to keep their feedlines warm.

On Six Meters, the "general call for a contac frequency remains the same as recommended



W3TDF, top man on 2 in Pa.

the ARRL. DX seekers claim to support 50.0 as an alert frequency.

Let's give these frequencies a try and remembe to observe the "contact and vacate" rule.

CW Band for Two Meters

By now I'm sure that you have all heard th the efforts to get the ARRL to recommend a c band for Two Meters were unsuccessful. Th board did, however, recommend that a study made of the advisability of such a move. (I ca resist observing that if the boys at headquarte would keep abreast of things, there would be need for a study to be made. They should alread know the answer).

It is obvious that the DX boys on Two Mete want a cw band. It is equally obvious that t way for them to get it is by doing instead of co

plaining. It has been my observation that the loudest proponents of a cw band on the low end of the band generally discuss the problem while running a k.w. of phone on the low end (They are generally pointing out that a gentleman's agreement will never work because the guy next door always operates phone on the low end).

The solution is very simple. All proponents of cw on the first 500 kc of Two Meters must adhere to a strict rule. NEVER (*not* Hardly Ever, but NEVER) operate phone in the cw band. NEVER answer a phone call in the cw band. ALWAYS write your ARRL director on the first of each month asking what he has done and is doing about obtaining ARRL sanction for a two-meter cw sub-band. If the ZL's can do it on Eighty Meters, it's obvious that the W's can do it on Two Meters.

W9BRN, Indiana winner on 6. 300 watts to a 4-125A, with a 4 over 4 yagi at 60 feet.

Ohio 2-meter winner W8GZW. Xmtr: pr 826's. Rcvr: pr 6AJ4's feeding HQ-129X. Ant: 20 elements at 55 feet.

CQ Summer Contest

The success of the last VHF Contest has given us the urge to have another one during the summer when the mountain-toppers can get out and do their bit.

WHEN? The summer contest will be held on the 18th and 19th of August. Starting time will be 200 p.m. local standard time on Saturday. Contest ends at midnight local standard time on Sunday, August 19th.

HOW? The summer contest will be operated under the same rules as the Spring contest with the following changes:

(1) Contest will be open for multi-band operators as well as single-band stations.

(2) Single-band operators may make contacts on any VHF band as long as the majority of their contacts are made on the band for which their score is submitted. Only one contact per station can be scored, and a given county can only be used as a multiplier once. Multiple contacts can be scored only if the station contacted is operating portable and has changed his QTH by twenty-five miles or more.

(3) Multi-band stations must make contacts on at least three of the VHF bands. Contacts can be made with any station once on each band and the county multiplier is the sum of the counties worked on each band. For instance you can work W100P on Six, Two, 1.4 and 0.7 for a total of four contact points and a county multiplier of four (If you can get him to operate portable twenty-five miles or more from his house, you can do it all over again).

(4) A special trophy is being prepared for the station turning in the highest multi-band score. This trophy to remain in the possession of the winner until the next contest at which time it will be again awarded to the high-scoring multi-band station. Permanent possession can be achieved by winning three times in a row.

Complete rules for the contest will be in the next issue. Gird your loins, polish your antennas and get ready for a real do.

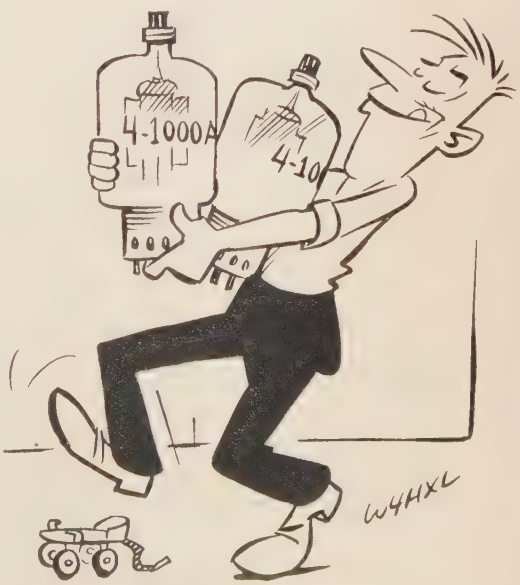
Moon Bounce

By the time you read this our Moon Bounce transmissions will be in full swing. Transmission schedules and frequency in use can be obtained by sending a request to ye old P.O. Box 2502, Medfield, Massachusetts.

From the Two Meter & Down Radio Club of Southern California:

"We have settled the date for our annual Picnic. As you probably know, this is the one big thing for our club in the entire year. It cements the relationship between all the Clubs in this area. We have the usual xmtr hunts, games, prizes and raffle. It has been in the past one of the bigger hamfests in this area; we hope to keep it that way. The date is the 12th of August; the place is Buena Park, California. I will answer any and all requests for information regarding our Clubs' activities."

73, Sam, W1FZJ



as reported by
Byron H. Kretzman, W2JTP
9620 160th Ave., Howard Beach 14, N. Y.

CQ Far East. That's the call that has gone out from W6SEW/J. John Porep reports that he has been in Japan for the past year or so, and is quite interested in having any RTTYers contact him if they should pass through Toyko (W6SEW was active on 40 meter RTTY from Oakland, California). John writes that he would like to serve as ". . . a sort of Far East RTTY Center with the purpose of gathering news from those engaged or interested in amateur RTTY operation, assisting others in building up converters, helping to make trades, and in general make a lot of new friends." Apparently, more surplus *Teletype* gear is available over there than in the States! John also says that he is "registered" with the U. S. Army in Japa so he can legally purchase and/or sell any of t equipment. If you are fortunate enough to get Japan, John's address is 1-1 Sanbancho, Chiyod ku, Tokyo. His telephone number is (33)1288. So very pleasant memories of Japan were recalled W6SEW's, as your RTTY Editor was a "guest" the Signal Corps there in 1945-46.

AMATEUR RADIOTELETYPE CHANNELS

National, FSK (mark frequencies; space 850 cycles lower) 3620, 7140, 27,200, 29,160, 52,600 kc.

National, AFSK (2125 cycles mark; 2975 cycles space) 27,200, 147,960 kc. calling & autostart 147,138 kc. repeater & duplex

California, AFSK 147,850 kc. calling & working

Washington, D.C. AFSK 147,960 kc. calling & autostart 147,495 kc. working

Chicago, AFSK (FM) 147,700 kc. calling & working

Detroit, AFSK (FM) 147,300 kc. calling & working

New York, AFSK 147,960 kc. calling & working

Tuning FSK

"How do you tune in FSK, properly?" Tl question has ben very nicely answered by W1FC Here is the answer, just as A1 so neatly put it: find that some of the newcomers in the field RTTY are not aware of the importance of obta ing the proper adjustment between the main tu ing dial and the b.f.o. of their receivers.

"The common practice is to simply tune arou until an RTTY signal is heard and then adj either the main dial or the b.f.o. until a *mark* to of 2125 cycles is fed into the converter. This fr quently results in the main dial being improper set with respect to the pass-band of the receiv If the receiver has an S-meter, (and what receiv doesn't, today) the proper procedure is as follow Turn off the b.f.o. and set the receiver for A reception, which activates the S-meter. Tune to steady *mark* signal (your own VFO is the be source of this) and adjust the main dial for ma mum S-meter reading.

"Now switch the FSK circuit to space. In a probability the S-meter will move to a low reading. With the *space* signal still on, adjust t main tuning dial so that the S-meter reading about half way back to its maximum readin Change the FSK to *mark* again and see if t S-meter stays steady. If it doesn't, again adj the main dial until a point is found where t S-meter does not move when the FSK is switch from *mark* to *space* and back. Having found t adjustment of the main dial, leave it alone a then turn on the b.f.o. This will probably in m receivers disable the S-meter, (the NC-300 in S position leaves the S-meter working, which is advantage of this receiver for RTTY) but this w not matter. Now adjust the b.f.o. so that the co rect audio tone for *mark* is obtained.

"From then on the b.f.o. should not be mov from that spot and all future tuning of the receiv in looking for RTTY signals is done with the ma dial, setting the main dial to obtain the corre *mark* tone. The result of this procedure is to obta the same signal output from the receiver on bo *mark* and *space*. It is surprising how much cryst filter can be used with most receivers when usi this line-up method, thus getting full advanta of the receiver's selectivity. Of course it is esse tial that the receiver be thoroughly warmed up b fore commencing the adjustment for any su sequent drift, particularly in the b-f-o oscillato will upset the pass-band setting."

Across the Nation

The San Francisco area is now operating a AFSK RTTY net on 6 meters, according to K6IO and his XYL, K6PMK. Operation is on 50.7 M

with transmitter powers from 10 to 500 watts. Most of the fellows, K6BAO, W60WQ, K6KF, and K6QAX, for example, are using Model 26's. K6IOG has a 4-element beam up in the air 60 feet, and is making plans for a 6-element job.

W7JLF has been copying RTTY on the 15-meter band around 21.1 Mc. He reports that W7LPM in Seattle works that band regularly, working WØDTY in Denver and a W8 in Detroit.

W9QBH is now Pfc. Robert J. Hajek, 9393 TSU, Det. #1, box 174, White Sands Proving Grounds, New Mexico. (Drop him a line, will you, fellows?) Bob finds no MARS RTTY activity down there (!?) but has a 6 meter mobile 'phone rig in his car. His father, W9ECA, is still on 6 meter RTTY, though.

W2SMX at Farmingdale, W2GWL at Lake Ronkonkoma (both on Long Island), K2IPR in Neptune City, New Jersey, and W1VIY of Trumbull, Connecticut, are active on 147.96 Mc. with high power, big beams (horizontal, naturally), and super-hot receiving equipment. At present they are using AFSK, with FSK contemplated in the near future. They have been pointing their super-sensitive sniffing gear up Boston way, but nothing has been heard from the Boston RTTY gang, so far. *Sam, where are you?* Both W2SMX and W2GWL have heard a strange FSK signal using 5 kc. shift with the *space* on 144.06 Mc. and the *mark* on 144.065 Mc. It apparently is horizontal polarized and comes from the direction of Boston. Anybody know anything about this?

Just about the most active RTTY station from the third call area is W3KYR. It seems that anytime W2JTP chases the brown fox or a few RY's on 3620, W3KYR comes back with that walloping signal. This is the station of the St. Mary's Boys' Club in St. Mary's, Pennsylvania. Fred, W3LGK, does most of the operating. We hope to have a picture and story on this station very soon. Watch for it.

Comments

Your RTTY column is in somewhat reduced form this summer month, due to vacations, etc. Next month we continue the "RTTY Principles & Practice" section with the inside dope on tape gear. *CW traffic men—be sure to catch this.*

Are you having difficulty working FSK on 80 meters because of the high level of static that prevails in the summer time? W2JTP is now using a receiver on 3620 kc. that has a 6SA7 linear (product) 2nd detector preceded by a 6SJ7 i-f limiter. No claims for performance are made as yet, but its use does make listening less nerve-wracking. Suggested is a plug-in adaptor to go into the "NBFM" adaptor socket provided in several of the larger communications receivers.

Let's hear from you; if not on 3620 kc. or 147.96 Mc. try Uncle's Postal service. It's pretty good, too. All letters are answered as soon as possible. If you would like to see your RTTY shack in *CQ*, send along a glossy print. Anything up to an 8" by 10" will be gratefully received. 73, Byron, W2JTP

FREQUENCY STABILITY

[*from page* 67]

But the essence of my song is this: it doesn't matter what circuit you use, or what lay-out you use, or what specific components you use—so long as they are components that will *stay* that way. High-Q is NOT necessary; you can make a coil out of wire solder, if you like, and if you keep the geometry of that coil constant—the frequency will remain stable.

The only reason the high-Q of the quartz crystal makes for stable oscillators is that quartz has an exceedingly high mechanical rigidity; since practically all the r-f energy in the oscillator circuit is going to be stored in the quartz crystal, and that crystal has great rigidity of characteristics, it dominates the sloppiness of the rest of the circuit.

But if the whole circuit is made equally rigid as to characteristics, then the high-Q of the crystal would be unimportant.

Use bare copper wire for the r-f circuits; air's a wonderful dielectric, and if the wire's bare, you won't be tempted to let it slop around loose.

Use high-quality by-pass condensers; they're in the r-f circuit, and a by-pass condenser with a crummy dielectric will be just so much crummy dielectric in the r-f circuit. ■

Radio Communications & TV Instructors Needed

Minimum Educational Qualifications:
H. S. Graduate (technical, vocational or academic major) plus 5-7 yrs. appropriate trade experience.
Maximum Age: 60
Salary: $3900 to $7600 in periodic increases.
Examinations: Theory, Practical, Oral English, Physical & Medical.
Working Time: Approx. 180-200 days per yr. Daily, 6 hrs 20 mins (incl. lunch)
Employer: Board of Education, City of New York, High School Division.
Contact Monroe M. Freedman, Administrative Assistant, Samuel Gompers Vocational & Technical High School, 145th St. & Southern Blvd, Bronx 55, N. Y. phone: MOtt Haven 5-0950.

National Convention in San Francisco

July 6-7-8 will see a mighty influx of us amateurs into the Bay City for a general confab, exhibits, talks, dances, and plenty of etc. You are going to be there, aren't you? Sure you are. Send $9.50 right now to cover everything to the National Amateur Radio Convention, 391 Monterey Blvd., San Francisco 12, California. Special XYL tickets will be available too. Prizes start with a Collins KWS-1! Gather ye at the Civic Auditorium and the Whitcomb Hotel across the street.

WHITEFACE

[*from page 45*]

was down the mountain a piece. We drove about a mile down the road and then pulled off to the side. With a bit of shoving from Sam and Hi I went down that mountain-goat's path. I'm not kidding either. On one side of the path was mountain, straight up; and on the other side was mountain, straight down. The path itself must have been all of twenty inches wide. I am very proud of the fact that I did take time off, by the time I was halfway along the path, to start worrying about the children. Hi told me not to bother about them, they were doing all right. The children skipped along the path as though it were a city sidewalk.

When we did arrive at the lean-to, we found that there was also a small cabin which Hi used rather than go down the mountain when the weather was bad. It was a beautiful spot with none of the comforts of home and lots of privacy. Hi made us some coffee while we were resting from the trip down the path. Later he took the children along some of the paths leading farther down the slope. By the time they came back I had geared myself to face the trip back up.

That evening it started to rain. Sam was undecided as to whether he should go to the tower and get on the air until Hi settled it by coming to see what was delaying Sam and by informing him that it wasn't raining on top of the mountain. The mountain top was in the clouds at night and they were usually storm clouds. It must have taken a great deal of courage to turn on the rig in the middle of the storms that hit every night. The lightning flashed all around and a number of times even struck the legs of the tower.

After two days of storms our tent was ripped and the cots had given up the ghost. Still, I was enjoying myself and the children were having a wonderful time. Sam slept all day. When the last cot gave way Sam had to take notice of the situation. After all, that was his cot. We discussed going home, but Hi came along right then and insisted that we use his lean-to up the mountain so that when it rained we could move into the cabin. There was nothing I wanted to do less than mo into the lean-to, but having the well-being my O.M. at heart I agreed to the shift temporary QTH.

After three nights spent in the tower in t electrical storms poor Sam still hadn't had contact on two meters. That night the gr event happened. He made contact with a s tion that was mobile in the air and anoth with a station somewhere in Massachusetts. made the whole trip worth while for Sa However that was the extent of the conta from Mt. Whiteface.

The following day we decided to take quick trip to Connecticut to visit some of t VHF gang. I thought we'd be back at ca for the night, and got a surprise to find that night-time we still weren't very close to o destination. We pulled off the road, set up o kerosene stove, cooked a few hot-dogs, ma cocoa and coffee and then settled down f the night.

Some well meaning citizen, passing in t middle of the night, thought there had be an accident. He kept going and reported it the next town along the highway. It *is* a sho to be waked up with a flashlight shining your face. After we explained our presence went on his way.

In the morning after breakfast, we start off and it wasn't long until we arrived at o destination in Connecticut. You guessed it, t fellow was away on vacation and wouldn't home for another week!

We had left most of our gear in the cab on Mt. Whiteface so we had to go back collect it. Naturally a terrific storm was progress when we arrived back at the cab It was some trip slipping and sliding dov that goat's path. Later, when I had just be over to pack something in the last carton ligh ning struck. It followed the phone line dov the path, struck the phone with a loud clan then jumped from the phone to a water pa three inches away from me. I survived, barel

We did enjoy ourselves even though t radio part of the trip was practically a flo The children saw a number of things includi the wild animals that Hi had promised. A me? I had a wonderful time relaxing from t normal wear and tear of every-day living. (

YL Net Picnic

W4HLF, Arlie, announces that the 75-meter YL net of which she is NCS will hold its annual picnic at Big Meadow on Skyline Drive in Virginia on August 19. Bring your family and a picnic basket. Each YL is asked to bring an inexpensive gift, preferably something she has made, to exchange. For additional information or reservations at Big Meadow, write to Charlott Burgess, Reservation Clerk, Va. Skyline Co., Inc., Luray, Va.

New Club Rates Announced

Have the Secretary of your club drop a card t
Harold Weisner, Circulation
CQ Magazine
67 West 44th Street
New York 36, N. Y.
and ask for the new Secret Appallingly Low Cl Subscription Rates. He will try to get these your club while you are still young. Don't forg to give your club mailing address, eh?

YOU HAVEN'T REALLY HEARD

SSB

CW

AM

UNTIL YOU HEAR IT ON THE B&W ADAPTER!

The B & W Model 370 Adapter can be easily hooked up to your present receiver to give you reception which you never dreamed possible before.

SSB Truly superlative SSB reception—far better than the so-called SSB built into many of today's receivers. The model 370 adapter not only lets you select the upper or lower sideband by a flip of a switch, but it *also effectively rejects all other unwanted signals.*

CW The model 370 provides true single signal operation . . . suppresses unwanted heterodynes by 50 db, and you can select either side of zero beat merely by flipping a switch—no tuning required. No trouble at all to copy a weak station even with a local KW as close as 300 cycles.

AM The "370" lets you tune either sideband of an AM station and still read the signal without any noticeable attenuation. Many times more effective than crystal selectivity. QRM just disappears.

You can add this adapter to all communications sets without, in any way, changing the receiver characteristics.

A precision 20 kc torodial type filter with a 3 kc passband provides extreme skirt selectivity. Unwanted signals outside the passband are suppressed by a minimum of 50db. The entire unit is self-contained with power supply and a 7" dynamic speaker. Get your distributor to give you a demonstration, or write for complete information contained in the new B & W Catalog.

B&W

BARKER & WILLIAMSON, INC.
237 Fairfield Avenue, Upper Darby, Pa.

TV Filter [*from page 21*]

automobile chrome polish in order to make a more pleasing picture.

The tuning capacitor is a *Hammarlund* APC-100 air trimmer. Although ordinary coax connectors are shown, the popular (and cheaper) Motorola plugs will work just as well. A two-foot length of #8 wire completes the modest parts list.

Presumably your 6-inch cans will have bottoms but no tops, since it is generally necessary to cut off the top to empty the can and there is no good reason for the original user to remove the bottoms. The first step in constructing the filter therefore is to remove and save the bottom of one of the cans. Next solder together the three small cans one on top of another and fasten the stack securely to the center of the large container. Good electrical contact over a large area is important here. I used 6 or 8 sheet metal screws through the bottom, reinforced by soldering around the edge.

Drill holes of appropriate size opposite each other near the bottom edge of the remaining 6-inch can and mount the coax connectors. The coupling loops are formed of the #8 wire and extend from the connectors horizontally to within ½ inch of the inner conductor of the resonator, then straight down and out through two holes drilled in the bottom of the unit. The APC trimmer is spotted at any convenient point where the stator terminals will extend near the top rim of the inner conductor when the filter is assembled.

Solder the two 6-inch cans together, then turn the unit upside down and solder the ends of the coupling loops where they extend through the bottom. Connect the trimmer stator to the edge of the inner conductor. The rotor of course is grounded to the outer shell. Theoretically, increased efficiency should res by distributing this capacity all around rat than lumping it in one spot. This could done by using four 25 $\mu\mu$fd. trimmers equa spaced in a circle, connected to 4 differ points on the inner conductor.

The resonant frequency of the filter c then be checked with a grid-dipper loos coupled to the trimmer stator connection. H Q will be indicated by a very sharp dip. Re nance in the 6-meter band should occur w about 75 or 80 $\mu\mu$fd. effective capacity. La ing a grid-dipper, the resonant point can found just as well by listening to the recei or watching the plate meter on the transmit Little or no retuning of the plate tank c denser of the transmitter should be necess after peaking the filter. Variation of coupl for proper loading is accomplished by be ing the coupling loops closer or farther av from the inner conductor. Finally, solder the top, retune slightly if necessary, and cavity TVI filter is complete.

Checking the transmitter output with a li bulb for a dummy load both with and with the filter will disclose little or no discerni loss in power. While the re-entrant filter v do much to suppress TVI, like all other a TVI devices it is not a cure-all in itself, requires the backup of careful design in other parts of the transmitter. It will prev unwanted energy from going out the anten but it cannot prevent radiation from other p of a poorly-shielded or inadequately-filte transmitter.

Although the finished dimensions of the meter model may appear somewhat bulky, it means the difference between TVI-free op ation and remaining off the air, as well it mig then room can always be found for it sor where in the shack!

Montana

Scenic Hamfest, on beautiful Lake McDonald in Glacier National Park. Special events, contests, prizes—Cabins, camping and trailer space available. Come as you are and bring the XYL and family for an enjoyable visit to lovely Montana. This is the 21st annual Hamfest—to be held Saturday and Sunday, July 21-22, at Apgar Camp Ground, West Glacier, Montana. For further information write Frank Hart W7UPR, Rt. 1, Sunset Drive, Kalispell, Montana, secretary-treasurer Glacier Park Hamfest.

Minnesota

The Saint Cloud, Minnesota Mike and Key Radio Club is holding their annual Hamfest family picnic on August 5th at Wilson Park, located in East Saint Cloud on the banks of the Mississippi, across the river from the hospital. All modern facilities, shelter house, picnic tables, playground equipment, swimming beach and free coffee will be served. Signs will be posted on all highways.

Activities will include—Registration prizes, Hidden Transmitter Hunt, Mobile Field Strength Contest, Oldest Ham present, Ham from the furthest distance and games with prizes for the XYL and Harmonics so bring the family.

Registrations start at 10 A.M. $1.00 per call includes the family.

For further information please contact WØRVO Bob Molitor 315-7th Ave. North.

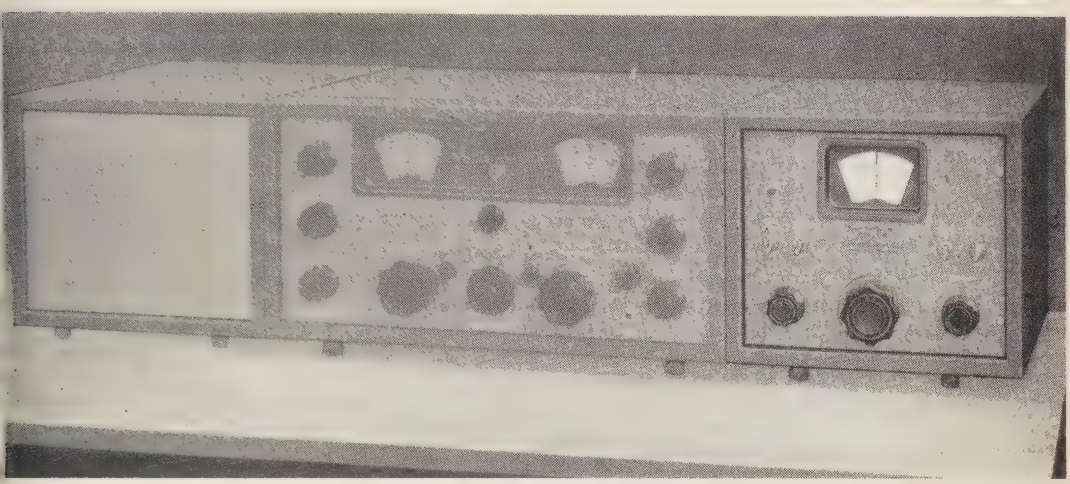
Penn

The South Hills Brass Pounders and Modulators, Inc. v to announce their 18th annual Hafest to be held Sunday, August 5th, at Totem Pole Lodge, South P Pittsburgh, Penna. Festivities start at 12 noon till For the past seventeen years all who have attended h had a whopping good time. The inevitable Swap Shop plus demonstrations and activities for young old will make this the outstanding ham event of year. PRIZES GALORE. Games to keep the Jr. Op. b Contests to occupy the XYL. Plenty of picnic sp Plan now to attend. Register in advance and save. registration ends July 21, 1956. Make checks payable South Hills Brass Pounders and Modulators, Inc. S $1.50 to S. J. Zolinas W3QWW 423 Parkwood Rd. P burgh 10, Penna. Tickets $2.00 at the door. Novice t will be given, bring your examination papers. Club tion W3PIQ will operate on 29.2 mc to "zero in" mobiles. See you at the hamfest.

Maryland EPN Annual Picnic

Contests, ladies and children's programs, rummage s prizes, and of course eating will be featured at the nual picnic of the Maryland Emergency Phone Net Braddock Heights Park, Braddock Heights, Maryland miles west of Frederick, Md., on U. S. 40A), Sun July 22, from 10 a.m. 'til? For advance registrati C. C. Worsley, W3TYJ, 104 Northwood, Silver Spri Md. 50c per, children under 12 free.

Single Sideband Adapter- GSB-1



The TMC Model GSB-1, Single Sideband Adapter is a filter type slicer permitting accurate and simple tuning of SSB signals.

The 455 Kc input is converted to a low frequency by means of a mixer and oscillator combination which allows selection of either sideband. The difference frequency is fed to a carefully designed and manufactured bandpass filter, which restricts the band width to 3 Kc at the 6 db points. This filter is so effective that the skirt width at 40 db is only 4.5 Kc. The filter output, in turn, is fed through a second mixer, or product detector, where it is combined with a stable 17 Kc local oscillator. The result is once again passed through a filter having a cutoff at 5 Kc, thus eliminating all unwanted mixer products. The output is a relatively noise and interference free audio signal.

The TMC Model GSB-1 contains a number of features which make it a more useful device. Since single sideband signals require critical frequency adjustment, this unit has been provided with electrical band spread which reduces tuning to the point of greatest simplicity and ease. In addition, AVC is provided within the Model GSB, over and above that which already exists within the receiver, thus serving to further prevent powerful local stations from overloading the slicer. A noise limiter, which reduces impulse peaks, has also been included in this unit.

The Model GSB-1 although originally designed for use with the Model GPR-90 receiver (which already provides the proper terminals) may be used with any receiver which will provide .3 volts (rms) R.F. input at approximately 455 Kc and where access to an audio grid is available.

FRONT PANEL CONTROLS:

- Power ON/OFF Switch
- AVC ON/OFF Switch
- SSB-AM Selector Switch
- Upper or Lower Sideband Selector Switch
- Noise Limiter ON/OFF Switch
- AVC FAST/SLOW Switch
- Main Tuning

SPECIFICATIONS:

FREQUENCY RANGE:
452-458 Kc.

TYPE OF RECEPTION:
AM, SSB (Upper or Lower), CW

IF INPUT VOLTAGE:
0.3 volts rms (normal) for 0.3 volts rms audio output.

IF INPUT VOLTAGE RANGE:
0.1-10 volts rms (with AVC).

AVC CHARACTERISTIC:
With 40 db change in input signal, output remains constant within 9db

INPUT IMPEDANCE:
High-from IF.

OUTPUT IMPEDANCE:
To match audio grid.

INPUT POWER:
115 volts, 50/60 cycles, 46 watts.

CABINET SIZE:
12" wide x 10" high x 15" deep. Matches GPR-90 for height & depth

Illustrated with the GSB-1 (right side) is the TMC Receiver GPR-90 (center) and the companion speaker - Bulletin 1790.

The TECHNICAL MATERIEL CORPORATION

TMC Canada, LTD.
OTTAWA, ONTARIO

MAMARONECK, NEW YORK.

TMC Single Sideband Adapter GSB-1 (Bulletin C-194) Complete with all instructions
AMATEUR NET

$149.50

RADIO INTERFERENCE BUREAU FOR LOS ANGELES
1216 W. First Street, Los Angeles, Calif.
ANNUAL REPORT FISCAL YEAR 1954-55
HISTORY OF INVESTIGATIONS

A. C. Modulation	20	Garage door opener	
Address incorrect	8	Having no trouble	
Air conditioning unit	4	House wiring	
Aquarium heater	16	Ignition (automobile)	
Auto call signal	1	Medical—diathermy	
Beauty/barber shop equipment	2	Moved	
Building material	13	Neon	
*Cleared, cause unknown	384	Power system	2
Cross modulation	33	Power—other than D. W. P.	1
Distance—short wave	1	Radio receiver	1
Door bell transformer	40	Radio receiver installation	
Electric adding machine	6	Refrigerator	
Electric blanket	8	Refrigerator butter compartment	
Electric drill	6	Sewing machine	
Electric fence	19	**Station—amateur**	
Electric fan	4	Station—other than amateur	
Electric flasher button	4	Street light	
Electric insect killer	1	Telephone system	
Electric light bulb	3	Television receiver	2
Electric range	2	Television receiver installation	
Electric saw	12	Television receiver radiation	
Electric shaver	8	Thermostat—Heating pad	4
Electric shaver rectifier	6	Thermostat—Miscl.	
Electric sign	2	Traffic flasher	
Electric sign flasher	14	Universal motor	
Electric typewriter	1	Violet ray (Pasteuray)	
Electric vibrator	4	Voltage	
Electric washing machine	2	Welder	
Fluorescent light	70	225 card (unable to contact)	
Furnace igniter	1	**TOTAL 2542	

(*) "Cleared—cause unknown" includes all investigations where the interference disappeared before source was located.

(**) Discrepancy in total of summary from total work orders completed is due to more than one cause of trouble being found on one work order, or one cause of trouble affecting more than one customer.

Good-bye 160

By unanimous order, the FCC on May 17 passed new rules prohibiting 160 meter operation as of July 9 in the following areas: Texas, east of 99° West and south of 32° North, Louisiana, Mississippi, Alabama, Georgia, Florida, Puerto Rico, Virgin Islands, Alaska and Guam.

Other areas presently using 160 meter operation remain unchanged.

It is interesting to note the logic utilized by the FCC in easing us out of these bands. First, the Gulf of Mexico Loran chain was changed from 1950 to 1850 kilocycles because of harmful interference to the maritime mobile use of 2009 kilocycles on the west coast of Florida. The new Loran frequency of 1850 kc was then placed in a position of being interfered with by amateurs in the low frequency 160 meter band. Therefore, the amateurs had to go.

The FCC also uses as reasons for barring an teurs in the above areas the original stipulati placed when they granted 160 operation, that th could change the frequency allocations as th saw fit with no invited comments from the pub as this would be contrary to the public intere To quote the FCC "The public interest, conve ience and necessity will be served . . . ." by the changes. The commission also is requesting th all amateurs comply with this order on a volunta basis immediately upon receipt of this informati

Ham Scholarship

The Lakeland Amateur Radio Society of 1709 Mocki bird Lane, Lakeland, Florida, is in the process of setti up a Scholarship Fund for outstanding and needy stude in any field of the Physical Sciences. This fund ca about as a result of the death of Eric V. Ericks W4VIE and is to carry his name. Any suggestions comments in the formulation of this scholarship fu will be appreciated and comments are invited by t Florida gang in the establishment of this wort Amateur project.

LU2ZY *[from page 53]*

tion. We were rescued by helicopters, eq ment and all, and taken to a naval trans ship. From there we flew to Buenos Aires we're mightly glad to be able to look at other and shake hands over an expedition done.

We wish that we had been able to stay lo and give everyone a contact with this country. We thank all of you who in one or another backed us up.

SCRATCHI

[from page 8]

ing on all bands with same gain, contro freakwency with twisk of rist—if not, se my letter of September, 1955.

But I knowing you convinced by now letting me telling you abouts my newest, gratest—Gracious to Goodness, Hon. Ed forgetting what I going to telling you!!

Which reminding me. I been riting you ters longsame time now. Howcomes you n answering me?

Respectively yo
Hashafisti Scra

YASME

[from page 51]

knot parted company with the end of the as I pulled and I took a beautiful backw dive into the cockpit.

Another One

Well, I hated to admit it, but after diagno the trouble I discovered that a valve was st ing. There we were with another engine strip down. Still no wind, but now the sea developed an unrythmic roll which was to for me to synchronize my body with . . . I of leaned to port when I should have lea to starboard, and any sailing types among will realize that can be fatal. On several o sions I nearly went over the side. This woul have mattered too much because the ship dead still and even the sharks had become interested with the lack of activity of Yasme.

[Continued on page 100]

THE NEW FO-6

6 METER and 2 METER

Oscillator Assembly!

the Sure-Fire way to achieve . . .

STABLE CRYSTAL CONTROL *with High Frequency Crystals*

IT'S A 3-WAY UNIT! . . .

1. **MIDGET 6 METER TRANSMITTER**—Provisions are made for separate B+ connections to the buffer stage for modulation.

2. **DRIVER UNIT** for a higher power 6 meter transmitter. Will work into 5763 tube which will provide ample drive for a 6146 final. For 2 meter operation the pentode section of the 6U8 tube may be used as a tripler, or the unit can operate straight through on 48 MC and drive a 5763 tube as a tripler.

3. **RECEIVER LOCAL OSCILLATOR FOR 2 METERS.** By using the pentode section of the FO-6 as a tripler, this unit will provide injection voltage for 2 meter converters.

6U8 Tube
Crystal Oscillator Range
48 MC to 54 MC
Output 50-54 MC or 144-148 MC
(Specify When Ordering)
Crystal Required—3rd Overtone
Type FA-5
Plate Voltage—250 volts @ 20ma

Filament Voltage—6.3 volts @ 450 ma
Size—2" x 2¾" x 2¾"

HOW TO ORDER: For fastest possible service, crystals and Oscillator Assemblies are sold direct. When cash accompanies order, International pre-pays postage. Otherwise, shipment made C. O. D.

Kit (less tube and crystal)	**5.95**
Complete wired and tested with tube (less Crystal)	**9.95**
Crystal Type FA-5 48-54 MC (Specify frequency when ordering)	**3.90**

International CRYSTAL MFG. CO. Inc.
18 N. LEE PHONE FO 5-1165 OKLAHOMA CITY, OKLA.

[*from page 98*]

Back to work. Working on deck, whilst it much cooler, is also much darker. The sho must go on, so down came the motor and t sticky valve was fixed. This time I was a litt more fortunate in what was left over and on had a couple of small nuts. I realized that th must have come from the engine somewher I discovered a small hole in the top of the e gine which, when you take out the spark plu has lots of room inside. I naturally came to t conclusion that the nuts must belong som where inside there and accordingly dropp them in. At least I knew they wouldn't get lo and I could always fit them in the right pla later on.

Lady luck smiled on me. After flooding t carburetor the little engine needed only o pull to start it, and apart from the rattle of t two nuts (which became quite musical in t end) it ran very smoothly.

I kept it going until the batteries were oozi with amps. In fact, they oozed so much th acid got pumped out of them all over the plac I realized this was happening when I had look at them with a match . . . the explosio of the battery gas loosened three teeth. T time was ripe to press that button again.

Off with the charging plant and once aga the suspense of pushing that button . . . Th time there was a high pitched whir, a fe wheezes, a whine, a couple of clonks, and faint chugging with a limp. I knew then th the engine was actually going. As she graduall warmed to the task of keeping going the spee increased, and there at last I had succeeded making something work. . . .

Amazing Discovery

After she was running I opened up the i spection cover where I had stuck the odd bi that were left over and found that the coff grinder action in the gear box had nice mashed up all the parts. I must admit that ran quieter then than it had for a long time . think I'll patent the idea.

By this time it was daylight and my o friends the sharks had joined the convoy, com plete with pilot fish on their noses. All m tiredness had gone, so after removing the be part of the grease from the galley and feedin it to the sharks, I got cracking on some gru

Oh boy, was it good to sit out there in th early morning sunshine with a plate of egg and spuds, and loads of coffee. There was th chilly bite in the air that comes in the ear morning in the tropics, and it was really e hilarating to sit there and rest whilst the Yasm churned her way through the water at a stead 4 to 5 knots.

I don't know how long I just sat the meditating, but I reckon I had earned a res That day, apart from skeds, was devoted to ju

[*continued on page 102*]

Engineering writers work with research and development engineers during formation stages of new equipment to produce clear, concise technical manuals, for use in maintenance and training, as well as specialized handbooks for U.S.A.F. aircrews.

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RESEARCH AND DEVELOPMENT LABORATORIES

Hughes Aircraft Company

Culver City, Los Angeles County, California

HUGHES

VACATIONING IN SOUTHERN CALIFORNIA? YOU ARE INVITED TO VISIT HUGHES.

[*from page 100*]

plain sitting. As the sun got lower I had th feeling that comes with successful accomplis ment. The engine had run smoothly all da Just before dusk set in I felt a faint bree against my bare back. At first it was hard discernible and I thought it was imaginatio but ten minutes later I really felt it. Being pessimist I refused to think it would stay, s I just sat there and ignored it, not daring hoist the sails and have the wind die again . . Half an hour later the wind made itself fe to such an extent that I couldn't ignore it. nipped smartly along the deck and hoiste everything she could carry, even a couple shirts and an odd sheet. The wind continue to blow with ever-increasing force so I stoppe the engine.

Squalls

How that wind blew! It certainly made u for all the time it had been aleep. I got dow those sails that didn't blow themselves ou leaving just the tattered mainsail and a sma jib up. We really churned through the wat at 6 to 7 knots. The seas which had been cal up to then developed into 10 foot waves o the beam. The old Yasme lifted herself proud over every one, never once taking a dro aboard. This was real sailing at last, the so you read about in books but very seldom se or experience. I had that feeling that this wi had come to stay, and I was right too . . . ho it blew, and how happy it made me to feel th we didn't have to worry about the gas situatio any more. I knew then that, providing I did n use the radio more than one hour a day, should be OK. I felt sure that the trade wi had come to stay. From the time that bree came up until 24 hours later we covered 15 miles by sights. We had a certain amount o assistance from the current, but I could tell b the log astern and the noise of the propelle freewheeling that we were piling up the se miles.

From then on squalls became more frequen concentrating around midnight and two in th morning . . . just to be plain cussed. For th uninitiated, a squall is something that can b seen in 99 cases out of 100, and usually do not cause any bother providing one takes re sonable care. However dark the night, one ca always see the squall that is going to hit yo coming up on the windward side. The sky always blacker in that area. Some hit yo within five minutes of sighting and others tak as much as an hour to creep up. The result the same: A wind of gale force hits your sh and unless you either run before it or shorte sail it is possible to lose your mast or a sail.

As you all know, my sails were in a pitifu state, so I had to be ready for every squall th popped up. When the first puff came, I ha through long association with these squall

[*Continued on page 104*]

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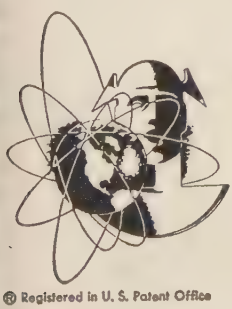

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[*from page 102*]

found that I could just manage to get everyt onto the deck in the three minutes before full blast hit me. This gave me a chanc stay below and rest, even if I didn't really s soundly.

I did on one occasion decide to run be a squall, thinking it would only last a s time. It kept up for almost an hour and me miles off course . . . miles I could ill a to spare. Coming into the wind would left no sails, solving the problem of sev It certainly wouldn't get me Canton, so I no more chances. There was no dearth of now, even though it never blew from the s direction for more than six hours at a t The seas piled up to fantastic heights, being on the beam, made life really unc fortable aboard. I had been used to the always being astern in most of my voya Providing I could keep the sails stuck toge and that I could sight Canton Island, I ha further worries.

I was in constant contact with KB6B was able to get weather reports from him they didn't help much since whatever pened I couldn't do anything about it. The continued uneventfully except for the ripped sails. I think you kind people will ur stand exactly why I had to ignore your numerous calls while I was at sea. I ha measure every drop of gas and conserve en to run the engine in the event of emergen would have taken on more gas in Tahiti, the cost was prohibitive, as it was with ev thing else there. I really thought I had a supplies to last the short distance of miles. I had never known the trade wind remain quiet for such a long time befor I don't think I could be entirely to blame let's blame the wind . . . it can't answer b

Now this Phoenix group of islands which I was heading are strictly coral a which means, in most cases, the land has a maximum height of around ten Some have coconut trees which help to s them, but Phoenix Island and Canton hav trees at all, and can only be seen from deck of a small ship like mine around 5 miles off. You can see that the navigation to be fairly accurate to hit them. The tide current charts are about as helpful as an boot since they say the current has a wes set of 10 to 25 miles a day. That makes it to lay off a course on the chart, and mear the end of a day's run, according to the ch I can be as much as 15 miles off course. F ing a tiny coral atoll under these circumsta didn't make me feel any too optimistic. I talk to the British Resident Commissione Canton through KB6BA and asked his ad on these currents. He kindly informed me not even the local fishing boats knew anyt

[*Continued on page 106*]

[*from page 104*]

about them. That made everything easy f me. . . . I would either hit Canton on the nos or miss it by 15 miles . . . really fine busines

That day, I took my usual sights, and a cording to the first one, Phoenix Island shou be within 5 miles on the port hand so, just check my navigation, I nipped out onto t deck and had a look around. Well, it real shook me because right where my sights sa I was . . . I actually *was*, and there as larg as life, just peeping above the horizon was golden strip of land. Sometimes it disappear beneath the waves as the Yasme dropped in a trough, and then as we rose like an elevato the island appeared again. It was exciting an reassuring to know that my first landfall w correct. I suddenly realized that it was no noon local time and I would arrive at Canto Island in the hours of darkness. I considere going to Phoenix and waiting so that I wou arrive at Canton in daytime. On secon thought, they have plenty of lights on Canto so maybe heading for it in the dark will be asset. There would be a full moon to help t I didn't realize then how wrong I was.

Phoenix Island as a stopping place was o anyway since I had no chart. I wasn't ev sure whether it was inhabited. Over the rig told Howie that I had sighted Phoenix a would allow 30 miles westerly current set make the next part of the journey of 76 mil I won't go into all the details of why I lowed that extra amount, but I did.

Lost Island

I passed on the dope that I should arri around midnight, given favorable wind. T wind was strong, but the seas held me up co siderably. Howie explained that the aircra beacon was visible for over 25 miles *if* the were any clouds, but if there were no clou it would only be visible for about 7 mil Naturally every cloud around Canton Isla was on vacation. . . . I don't know where th were, but they certainly weren't in the place wanted them. I realized that this was goi to be a sort of hit or miss stunt, and if chance I lost the island in the night, I shou just have to wait around as near as I cou until I could get some more sights. Radio co tact with Howie was made every half ho and it was decided that the airdrome wou put on all their landing lights when I reckon I was close enough to sight the glow fro them.

I checked the log astern, and figured that should be somewhere around 20 miles off t Island, but even though I climbed that ma dozens of times, not a light could be seen. T sky remained clear and brightly lit by the mo just to make things more difficult for me. had heard of sailing ships that had miss Canton Island in the past and owing to t strength of the current, had been unable

urn to it, so you can imagine my feelings at t time. I realized that with my pip-squeak gine and ribby sails there wouldn't be much pe for me if I went past.

Howie's signal had built up and I could ır the aircraft beacon blatting out with all 2 KW. I knew the place was mighty close, t couldn't see it.

The time had come when I reckoned that hould be able to sight the loom of the aero-ome lights, so I nipped into the cabin and 'e Howie the signal to switch on.

shot out of the cabin and shinned up the st like a monkey, but although I strained eyes and scanned the horizon the full 360 grees around the boat not a thing could be n. I told Howie that I would send up a ıal flare and maybe he would see it and reby give me a bearing. Using the usual e arrangement I sent up two flares and then ıot back into the cabin to wait for a report m Howie. He had climbed his antenna mast get a greater range of visibility, but after a e while back came a negative report.

Vhat wouldn't I have given for a nice load cumulus clouds to wander across the island! field of visibility was only 3 miles from deck, the light on the island around 25 t, that meant I should sight the light 7 miles The Island was 9 miles long which meant ould hit the Island first, travel two miles rland, then sight the light. A good idea, not very practicable. The suspense was ing me when the British Resident Com-sioner, Mr. Laxton, had the bright idea of ıg to the end of the Island with his Land ver and shining the headlights out to sea.

knew then that, according to Confucius was it another ball player), that unless I ıted something pretty soon, there was go- to be an awful grinding sound, and the sme Expedition would be over. I decided start up the engine just to be on the safe with that extra bit of power available.

'his was it; I lashed the tiller, put the old on course, and then went out on deck climbed the mast with the binoculars pped around my neck. I clung to the mast ı the wind going full blast and every move-ıt of the ship multiplied ten fold, scanning horizon for that elusive light.

Ainutes passed . . . they seemed like hours, nothing to see . . . was that a light ahead? . no, it couldn't be, absolutely impossible . too low, now it's moving . . . is it? . . . it's gone. There, I knew I was imagining one sees all sorts of things under strain. The oculars had misted up and I was getting confounded glinting on the surface of the from the moon.

Aust have another look without the binocs time. Trying to hold myself on the mast ı one hand and control the binocs with the er was too tough. Why did I bring the darn

[*Continued on page 126*]

Dear OM:

Take a look at page 90 of your May issue. My c W8FGX not W8FXG as erroneously listed in three ferent locations in this issue.

After finally winning a spot in this contest such licity makes it hard for me to convince the O.W. DX contests are not for the birds. Seriously OM, a big kick out of the contest and would appreciat correct call on my winners certificate.

Jacob W. Schott, W8
3110 Costello Avenue
Cincinnati, Ohio

Dear Wayne:

Every once in a while a guy gets so frustrate could lay down and kick the floor with his heels l 2 year old.

He builds a piece of miniature gear and finds he meter it without plugging in something or typing VTVM. All he wants is something to say "yes or or "more or less."

Miniature meters are fine, but they usually lac sensitivity for many applications, and are apt expensive. The only real solution is a miniature ele eye indicator.

After 20 years of puttering, I located a real mini eye which is only 1¼" long (rather 1½" including and ¾" in diameter. The price?—eight fat bucks sensitivity—oush!!. you still need a d.c. amplifie push it for avc applications, requiring another nearly as big.

Querying two large manufacturers on how con sensitive miniature electron eye tube—results one a common to both—limited market!! To this I say an may quote me "Nuts."

I guess the fellow who said what he did abou better mousetrap didn't figure on tube manufactur

Bill Fishback, W
Old Comers Road,
Chatham, Mass.

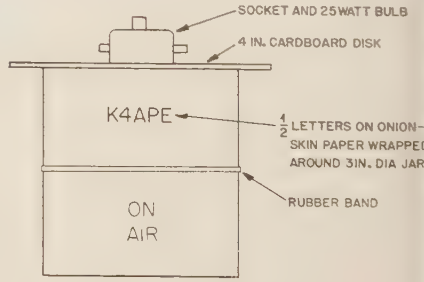
P.S. Or maybe I'm just out in left field!!

A Lamp For Your Station

Here is how you can have your Station Call Le an "On the Air" indicator, and illumination for station clock combined into a modern ornamental

All you need is a set of gummed foil letters ½ high, costing a dime at your 5 & 10; a sheet of skin paper or thin typing paper and a rubber ban empty glass jar; a cardboard disk; cord, plug and

The construction steps are simple. Arrange you letters on the onion-skin paper. On the next line "ON" and on the third line "AIR." Mine filled a 3"x3". Wrap the paper around the jar (peanut b string beans, mayonnaise or what have you eaten lat and hold in place with rubber band or pressure-sen



tape. Cut from cardboard a 4" disk. Cut a hole i center 1¼" diameter. Insert brass socket with push-b switch into the disk. Use a 25watt lamp. Place over opening of jar with bulb inside. The bulb gives a diffused light through the paper. Your call l and "ON AIR" stand out prominently.

Other possible arrangements include using a light bulb and socket connected to the filament wi of your transmitter, applying foil letters directly t glass jar, lettering on the jar with nail polish.

—Louis A. Josephson, K

Dear Sir:

We should be grateful if you could let us have publicity in your esteemed magazine.

[Continued on page 110]

SINGLE SIDEBAND TECHNIQUES

by Jack N. Brown, W3SHY

This is the latest addition to the "*CQ* Technical Series." Over 2000 Hams took advantage of our pre-publication offer and are now probably sitting back enjoying Jack's breezy style of telling the full story of SSB. This book is a continuation of Jack's series "Getting Started on Single Sideband." In this book he goes on to describe two different SSB transmitters and several items of useful test equipment, and throws in a good background on how to keep your SSB signal clean. This is the only book of its kind on the market. Some may try last-minute imitations, but they'll never equal it.

112 pages $1.50

Radio Amateurs'

MOBILE HANDBOOK

by William I. Orr, W6SAI

Going Mobile? This manual is indispensable. It covers in logical step by step form all facets of Mobile Operation. This book is the only complete source of such information and is not just a collection of reprints of magazine articles. No other book or manual tells you how to adjust your car regulator, information worth many times the price of the book and little known even in automotive circles. Written in the usual Orr style, the book is both thorough and easy to understand. The book is filled with valuable information nowhere else available and is profusely illustrated with photographs and diagrams. Invaluable.

192 pages $2.00

Q, THE RADIO AMATEURS' OURNAL

well-known Hams and authors from ound the world

w format new cover, new material, better ter are the by-words at the *CQ* Editorial es. Pertaining to the hundreds of letters ved during the past summer on "what ant in *CQ*," the editors put their heads ther and came up the this NEW looking . Regardless of what month you ose out of the next 12 or 24, *CQ* will tain first-rate material from the best iors in the Ham game. Your subscription guarantee (a money saving one at that) will be among the first to see these ures.

e Page 117 for subscription blank)

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letters [*from page 108*]

The London Members Luncheon Club is an infc gathering of Members of the RSGB, who meet for once a month, usually on the third Friday, at Bedford Corner Hotel, Bayley Street, Tottenham Road London W.1., and we should like the opport of inviting, as our guests any of your readers happen to find themselves in London at any time.

We have during the past 12 months, had ove visitors from overseas, but we feel that there be many more who do not know of our activity, a short notice in your magazine would no doubt to bring it to the notice of others.

A telephone call to me at Ruislip 2763 or to hq at Holborn 7373 from any who are in En and who can find the time to lunch with us be a great help.

Thanking you.

73,
Frank W. Fletcher, G
Ruislip, Middlesex,
England

Danger: Blasting Caps

Dear Wayne,

Perhaps you will remember me as the author of "The I's Have It" which appeared in your Septe 1955 issue.

I hope that the readers of your magazine ca advised of the dangers of operating either fixe mobile in the vicinity of any operation making u electrical blasting.

Keep electric blasting caps and conduct blasting o tions at distances from operating radio transm and antenna equal to or greater than those in this t

Station wattage	Safe Distance (f
30	100
100	200
250	500
1,000	1,000
5,000	2,000
50,000	5,000
over	10,000

This is because the caps and pigtails act as pic to RF, which in turn can cause the caps to ex

Howard Millbourn, W4
Arlington 7, Va.

Printed Ckts.

Dear Mr. Morrissett:

I just finished reading the third article in your series concerning Printed Circuits. I would like to mend your magazine for presenting this excel written and informative series of articles.

Printed Circuits and more specifically etched printed circuits are becoming increasingly importa industrial electronics for rather obvious reasons. has been a sorry lack of information printed about medium in the amateur and ham publications. service which you have performed will permit hams and amateurs to become acquainted with more importantly to make use of the advantages Pr Circuits has to offer. The educational job you have is appreciated by those interested in the progress development of electronic techniques.

Once again congratulations on a job well done.

Al Geduld
TECHNIQUES,

"G" Mobile Operation

Mobile operation is on the upswing in England since the GPO has allowed the G hams to operate m some two years ago. Difficulties of mobile oper here are many. First is the lack of space in the cars used here and second, most all of our ge home made as commercial stuff just is not to be

The most popular freqs. are top and 2, with co up to 40 miles away not uncommon any where in land on 2. Top is used for local net working. E and 10 meters is slowly becoming more popular as ditions improve but on 80m, QRM is terrific from service and contacts are not often to be had ther

Power is restricted to 10 watts on 160 meter despite this contacts up to 100 miles are not uncom

Official recognition of the value of mobiles in gency use is slow but each emergency that we ass brings the official mind a little more knowledge th are around. This so much that among hams, the Amateurs Emergency Network is now an organi of some interest.

[*Continued on page 114*]

EDITORIAL

[*from page 12*]

from the author suggested that we celebra this mil(e)stone by publishing a book containi the "Hundred Best Scratchi." I have for seve months been contemplating putting out a "Be of Scratchi" booklet, but my notion was to ma it slightly more selective. So, you Scratc lovers, back to the stacks, pile through the fi and send some sort of communication to r regarding which are the greatest. Remembe *CQ* cannot be sued if you die laughing. Th is a risk you'll have to take. Lemmeno pron whichu like.

We'll put the book out faster if you sta ordering it right away. I don't know what t final price of it will turn out to be, but it w probably be between a dollar and two dolla You send a dollar right now and I'll see th you get a copy at no further cost when it com off the press. All those sending in loot rig away will get *autographed* copies! Be the fi in your neighborhood, etc. When you send t dollar please mention what it is for so I do go out and spend it for a present.

At every ham club the first question ask is, "Who writes Scratchi?" When I moved on Dick Spenceley for a few days last wint the first question he asked when he got r alone was, "Say, just who does wri Scratchi?" After so many years of carrying this mystery it seems only fair that on the c casion of the 100th episode that the auth should come out from behind that dialect a be introduced. If by any chance Dick happe to open this issue to the editorial by mista he will at long last find out that the author an old friend of his, someone he never su pected. As a matter of fact quite a few of y know him by another even more famous p name.

The gang out in Phoenix have been goi around in circles for several years now a still haven't really decided for sure who it They eye each other at meetings and try trip each other up with trick questions. Thin were pretty hot there for a while when the were a couple fellows who wouldn't come rig out and say they weren't Scratchi.

Gentlemen, the fellow who writes Scratchi

(*Continued on page 137*)

TREMENDOUS CRYSTAL CLEARANCE SALE!

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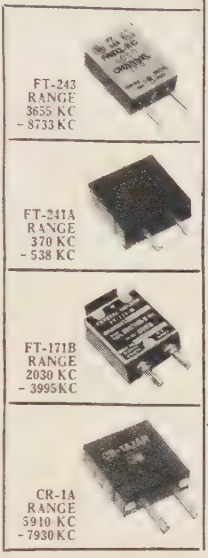

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370	393	415	485	508	531	400	462
372	394	416	487	509	533	440	463
374	395	418	488	511	534	441	464
375	396	419	490	512	536	442	465
376	397	420	491	513	537	444	466
377	398	422	492	514	538	445	469
379	401	424	493	515	540	446	470
380	402	425	494	516		447	472
381	403	426	495	518		448	473
383	404	427	496	519		450	474
384	405	431	497	520		451	475
385	406	433	498	522		452	476
386	407	435	501	523		453	477
387	408	436	502	525		455	479
388	409	438	503	526		457	480
390	411	481	504	527		458	
391	412	483	506	529		459	
392	414	484	507	530		461	

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5910	7380	6370	7480	6450	7580
6497	7810	6522	7930	6547	
6610		7350			

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2030	2220	2360	3202	3995
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2065	2260	2415	3237	
2082	2282	2435	3250	
2105	2290	2442	3322	
2125	2300	2532	3550	
2145	2305	2545	3945	
2155	2320	2557	3955	

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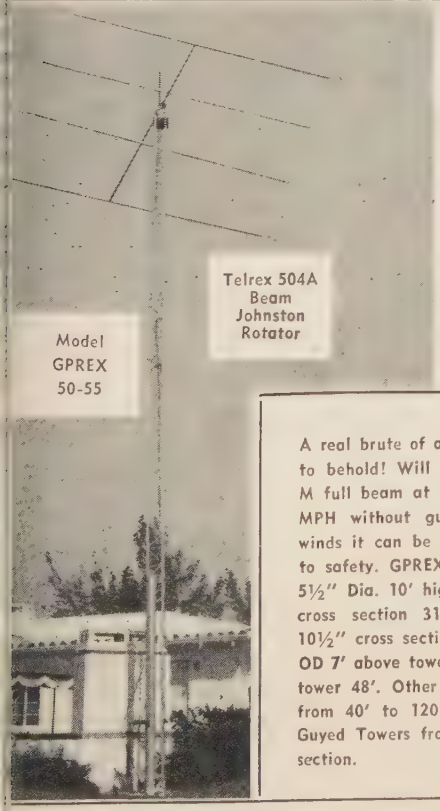
4035	5700	6300	6950	7710	8310
4080	5706	6306	6975	7725	8316
4165	5740	6325	7450	7740	8320
4190	5750	6340	7473	7750	8630
4280	5773	6350	7475	7766	8690
4330	5775	6373	7500	7773	
4340	5780	6375	7506	7775	
4397	5806	6400	7520	7800	
4445	5840	6406	7525	7806	
4490	5852	6425	7540	7825	
4495	5873	6673	7550	7840	
4840	5875	6675	7573	7841	
4852	5880	6700	7575	7850	
4930	5892	6706	7583	7873	
4950	5906	6725	7600	7875	
5030	5925	6740	7608	7900	
5327	5940	6750	7625	7906	
5360	5955	6773	7640	7925	
5385	5973	6775	7641	7940	
5397	6206	6800	7650	7950	
5437	6225	6825	7660	7975	
5485	6240	6850	7673	8250	
5500	6250	6875	7675	8273	
5660	6273	6900	7700	8300	
5675	6275	6925	7706	8306	

79¢ each—10 for $6.50

3655	6150	6550	7306	8350	8650
3735	6173	6573		8375	8690
3990	6175	6575	7425	8383	8700
6025	6185	6600	7440	8400	8733
6040	6200	6606	8090	8425	
6042	6440	6625		8450	
6050	6450	6640		8475	
6073	6473	6650	8173	8500	
6075	6475	7000	8175	8525	
6100	6500	7025	8200	8550	
6106	6506	7075	8225	8575	
6125	6525	7125	8275	8600	
6140	6540	7150	8280	8625	



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letters [*from page 110*]

Mobile rallies have attracted up to 100 cars w resulting QRM on the rallying freq. and grand ti had by all. Even one **motor scooter** complete with 5 w rig, six foot center leaded whip and intercom from senger to driver showed up.

Occasional contacts are made on 10 with US mob and the operator that has done it is in some what c bragging position as this type of thing is not too c mon yet.

Cliffe Metcalf G3DQ
Radio Society of Great Brit

Command Set

Dear Sir:

Just a short word of appreciation of the fine work are doing at **CQ**. Now and then a magazine prints article which is worth a whole year's subscription. S among others, I consider "Command Set Roundup" wh appeared some time ago, and "The Novice Q'5er" **CQ** for last January. One of the boys here (with a of help) built one. A bit of trouble was encountered f the fact that the Q'5er was pretty well battered up had a few things wrong with it. Slugtuned coils of proper range were used for the converter as those sp fied were not obtainable locally.

The results are positively amazing. A short test fo the Q'5er pulling in signals inaudible on my old BC Thanks for printing such a helpful article. The c remark I might venture on contributions such as is to impress the author with the fact that our pres generation of beginners don't know anything at about world-war-vintage gear, and that as a rule n do not have access to former copies of **CQ** or **QST.**

Think I will look into the S'9er too. Sounds g **CQ** is a bit of a pioneer? Grid dip meter, Antennasc Q Multiplier, etc.—

Brother Eymard
(W1UTA/DCN)
Mount St. Charles Acad
Woonsocket, Rhode Islan

Dear Wayne:

In response to your editorial in April 1956 **CQ:**

The North Penn Amateur Radio Club monitors 28 mc nearly all day every day and for sure every even We always welcome mobileers and would like to listed in any sort of directory of this type. We cover Montgomery County, Philadelphia and Bucks Cou area.

E. C. Pressler, W3ZXV, Sec'ty
NORTH PENN AMATEUR RADIO CL
Fairview Village
Pennsylvania

DX QSL's

Dear Wayne:

What does it cost to QSL? I didn't realize what it cost a DX station until I worked XP7 NG, Glen Voohis. Glen has been in the Bahamas about two ye and I was his QSO number 5617.

When he said that he had QSLed every QSO I as him about the expense. He wasn't bragging or compla ing, but he did comment that the cost for the two ye was close to $600!

I'm working on a DXCC and prevail upon DX tions for cards. But from now on when I don't get t I'll understand how expensive it can be.

Jack Edwards W4-D
Greenville, NC

Ed note: Send along international postage coup for those DX cards fellows.

Clubs Only

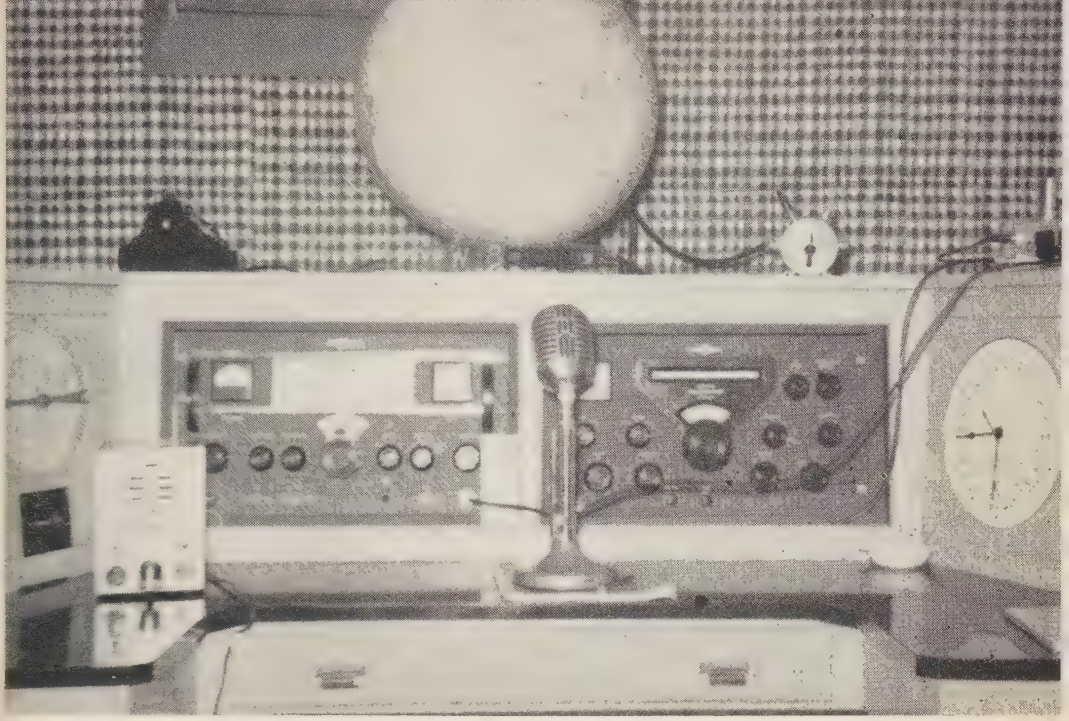
Hi Wayne:

Enclosed you will find a copy of the last issue of Club Bulletin (3 pages) of which I am the editor.

The name is not final as yet; we are in the process having a contest for the paper as well as a QSL c for the Jayhawk Amateur Radio Society of Wyand County, Kansas. Our Club call is KØDLE.

I will gladly put any other Club in the U.S. on mailing list if they would like to receive our li effort to the publishing world. Would also like to put on the mailing list of each and every Club read this article. Our circulation now is 200.

Robert M. Summers, KØB
2817 Roosevelt
Kansas City 4, Kansas



Whose Shack?

#2 of a series: Famous Hams using the CQ World Globe

As you can plainly see, we are practically giving away World Globes this month. Close scrutiny of the above photograph will furnish you a x10 handicap by narrowing the possibilities down to one call area. Wow, huh? So fill out your entry in the Mammoth *CQ* Guess Whose Shack This Is World Globe Contest right away. Remember, if you guess correctly Whose Shack This Is, you *win* a beautiful full-color *CQ* World Globe, plus a one-year extension or new *CQ* subscription! (negligible service charge of $19.94)

(Non-sleuths may still purchase the Globe and Subscription for the regular outrageous price of $19.95. Such sloth is not to be encouraged. Industry has its reward. A penny saved is a penny earned. A bird in the hand is worth—uh, a stitch in t— a rolling sto— well, anyhow, there's a great wealth of reliable folk data to substantiate this view.) So let's see that old Contest Spirit, boy. Get in there and Pitch! Dig up that little old entry fee and get into the Big Contest!

CQ Magazine CQ-7
67 W. 44 Street
New York 36, N. Y.

Gentlemen: Enclosed please find $19.95. Please send me the beautiful *CQ* World Globe *plus* a one-year ☐ new ☐ renewal subscription to *CQ*. This shack belongs to .....
If I'm right, please refund the difference.

Name ..... **Call** .....

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City ..... **Zone** ..... **State** .....

NYC residents add 3% sales tax.

[from page 80]

7th YL-OM Contest Scores

K5ADQ	11,428.75
W5EGD	8,268.75
W5KEC	6,555.
K6BUS	1,272.
W6EHA	585.
K6HVC	2,400.
W6NAZ	(conf.)
W6PCA	2,963.5
W6QMO	3,112.5
W6WSV	123.75
W7COX	6,732.
W7PTX	2,343.75
W7PUV	281.25
W8KLZ	2,242.5
W8MBI	250.
W8QOQ	13,340.
W8UAP	6,355.
W9JUJ	12,431.25
W9LDK	(conf.)
W9LOY	926.25
W9MLE	3,465.
W9MYC	1,211.25
W9SYX	680.
W9UON	2,520.
W9USR	315.
W9WZL	12,090.
KØBFS	13,005.
WØKJZ	6,191.25
WØZWL	78.75
KL7AZI	1,080.
KP4ZV	4,440.
KZ5KA	4,320.
VE3AJR	14,082.5
VE5DZ	1,534.
OM Phone	
W1BFB	560.
W1BNS	1,080.
W1FEA	96.25
W1LQ	87.5
W1OPZ	56.25
W1PKQ	(conf.)
W1ULS	573.75
W2BVN	96.25
W2COB	945.
K2DEM	302.5
W2DMU	(conf.)
K2DSW	1,292.5
W2DTZ	(conf.)
W2FLD	500.
W2GVV	(conf.)
K2HXR	577.5
W2MCO	712.5
K2MTL	261.25
K2OPJ	375.
K2PIC	637.5
K2PPB	100.
W3AXT	24.

W3DDV	701.25
W3MDO	228.
W3OP	135.
W3QLW	191.25
W3RRI	30.
W3VWJ	551.
W3YLL	468.75
W3UZS/4	78.75
W3ZHQ	472.5
K4ARP	697.5
W4CHK	510.
W4CVO	412.5
W4DKE	350.
W4JUJ	585.
W4WRH	332.5
W4WSF	393.75
W4WZT	64.
W5FHL	(conf.)
W5LVM	920.
W5ZWR	90.
K6DAC	945.
W6DAC	212.5
W6FGJ	1,462.5
K6HBA	210.
W6IDY	308.
W6JVA	1,100.
W6KNS	40.
K6OHM	60.
W6PAL	688.75
W7KOI	292.5
W7SFK	787.5
W7YNO/7	260.
W8AJW	1,462.5
W8IXG	(conf.)
W8JAX	(conf.)
W8RAB	1.25
W8SDD	15.
W8SVL/6	55.
W8UPH	7.5
W8UVD	468.75
W9ATW	(conf.)
W9BBD	90.
K9BJV/WØHAW	(conf.)
W9BYZ	(conf.)
W9CMC	1,715.
W9CNF	31.25
W9GIL	212.5
W9ITM	100.
W9NLF	52.5
W9OMM	783.75
W9SZR	697.5
W9TKR	761.25
W9UQB	11.25
W9UTL	112.5
W9VOD	297.5
WØAIN	37.5
WØBLH	446.25
WØCDL	(conf.)
WØGAX	90.
WØIUB	468.75
WØQWS	100.
WØSGG	20.

WØWAJ/Ø	708.7
WØWXG	270.
WØYJM	712.5
WØZZT	220.
EA4CR	(conf.)
VO6N	130.
OM CW	
W1AJZ	630.
W1FEA	540.
W1JYH	400.
W1LQ	480.
W1NLM	800.
W1OPZ	123.7
W1QMM	475.
W1RFC	520.
W1WEE	(conf.)
W1WMH	270.
K2BE	(conf.)
W2BVN	438.7
K2CKW	80.
W2CPA	140.
K2DEM	68.
W2DMU	(conf.)
W2DRM	(conf.)
K2DSW	2,058.7
W2EMW	648.
K2EWR	472.5
W2FLD	850.
K2GTC	855.
K2HXR	945.
W2ICO	475.
K2INZ/VE3	187.5
K2JAE	450.
K2JDD	15.
K2KDW	1,750.
K2KFJ	220.
W2LRJ	(conf.)
W2MCO	35.
W2NIY	783.7
K2OPJ	562.5
K2PDO	(conf.)
K2PIC	157.5
W2SAW	1,352.
W3CN	(conf.)
W3DDV	525.
W3HH	(conf.)
W3KQD	406.2
W3MAX	1,725.
W3MDO	1,176.
W3NRE	(conf.)
W3OP	800.
W3QLW	450.
W3RRI	9.
W3RYV	123.7
W3SIJ	275.
W3WHK	300.
W3YLL	742.5
W3YUW	637.5
W3ZHQ	1,025.
W3ZSX	345.
K4APN	(conf.)
K4ARP	540.
W4CHK	1,023.7
W4HFU	356.2

[Continued on page 118]

W5CIN/5/7/Ø Expedition

On April 7, 1956 three stations were set up at the junction of four states and three call areas. W5WKW, W5SGC and W5CIN hauled their equipment over the rough trail leading to the corner of Arizona, Utah, Colorado and New Mexico and over the weekend made 139 stations eligible for a special certificate.

[*from page 116*]

W4JUJ	1,210.	W8JAX	(conf.)	W9TKR	1,380.
W4WRH	813.75	W8JWX	31.25	W9YDQ	96.25
W4WSF	402.5	W8KPL	323.	W9YYG	243.75
W4ZPR	100.	W8RAB	143.	W9UTL	11.25
W4ZQK	900.	W8SDD	852.5	W9ZA	488.75
		W8SVL/6	15.		
W5GIF	52.5	W8UMP	675.	WØAIN	110.
W5ZWR	487.5	W8UPH	325.	KØAXH	297.5
		W8UVD	630.5	WØBQM	(conf.)
W6ACL	101.25	W8YPT	192.5	WØCDL	(conf.)
W6CLZ	110.			WØDUW	(conf.)
W6DAC	750.	K9BJV/WØHAW		WØGAX	1,045.
W6JVA	1,178.75		735.	WØIUB	875.
K6OHM	90.	W9BZW	1,687.5	WØQWS	488.75
W6QXF	(conf.)	W9CHD	420.	WØSGG	488.75
W6YBV	(conf.)	W9CNF	308.75	WØYJM	1,531.25
		W9CXY	1,017.5	WØYRY	531.25
W7CJZ	456.	W9GIL	20.	WØZBL	1,025.
W7FZB	11.25	*W9GOC/SZR*			
W7VIU/7	540.		1,687.5	*VE2CP*	373.75
		W9ITM	616.25	VE2IL	123.75
W8AJW	260.	W9KA	1,050.		
W8AQ	920.	W9KLD	725.	*VE3AVS*	320.
W8BDO	112.5	W9LNQ	1,207.5		
W8BMX	11.25	W9NH	520.	*VE6SX*	292.5
W8EKK	210.	W9RKP	231.		
W8JAE	(conf.)	W9RQF	807.5	*VO6N*	35.

QUAD YAGI

[*from page 37*]

Tuning the Beam

Tuning is easy. You will need a horizontal dipole with a diode and milliammeter connected as shown in *Figure 4.* The beam and pick-up

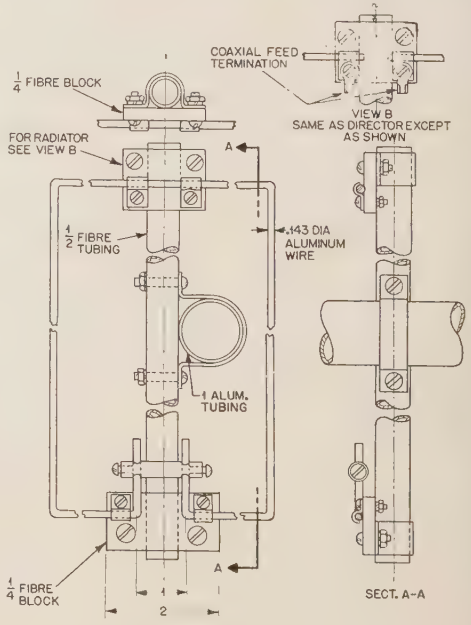


Fig. 5. Detail of one loop.

dipole should be set up about ten wavelengths or more apart, depending upon the power fed to the beam, and the procedure outlined below should be followed. ■

1. Set stubs of directors to shortest length.
2. Adjust driven loop for maximum meter reading.
3. Tune reflector loop for minimum reading with beam turned 180°.
4. Adjust first director, then each successive director for maximum reading.
5. Readjust driven loop for minimum S.W.R. or for maximum field strength which should coincide.

Adjustment of the reflector will have to be nade with either the pickup dipole closer to

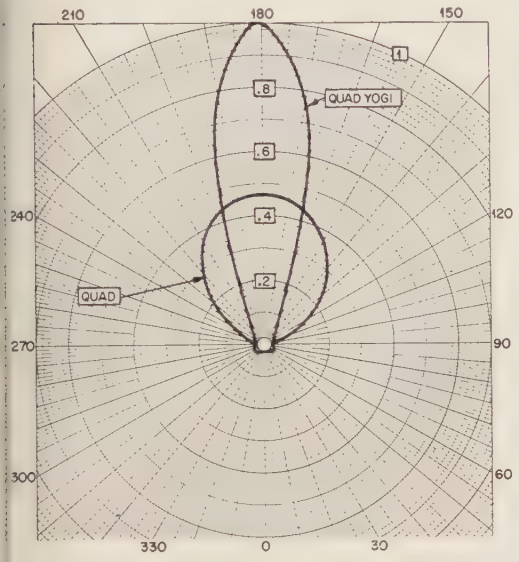


Fig 2. Reference gain.

ıe beam or a more sensitive meter. The adıstment of the elements are not critical except ɔr the reflector which needs careful adjustment ɔ obtain the best front to back ratio.

Operating Results

After several months of use on two meters ıe Quad Yagi has given very good results. Perɔrmance has been about equal to that obtained ith a 20 element array consisting of two Twin Fives" stacked horizontally. No direct ɔmparison was made of the two beams since ıe 20 element beam blew down last fall which as one of the reasons for designing a new eam.

Future work on the Quad Yagi is anticipated nd plans are to construct two seven element eams which will be stacked vertically. Work presently being done to obtain more informaon on the behavior of the loops and an atempt is being made to analyze why and how works.

I wish to extend my sincere appreciation ɔ the people who have assisted me in this ork and especially to Mr. Carl Schneideler W2AZL) who has been most cooperative and elpful. ■

Lazy Quad *[from p. 38]*

Results

A CQ at 5 PM immediately raised a stati in Detroit, a distance of 200 miles. The sign report with 50 watts input was 40 db over 9 Detroit. Very little or no QSB was evidenc on our signal. The received signal of the Detr station was free of noticeable QSB and 35 over 9. After these figures were established immediately connected the regular stati antenna (referred to in Feb. *CQ* as a droopi doublet or here in Michigan as a modified verted V) to the transmitter and made a mo gratifying check. Our signal in Detroit dropp to 15 db over 9 and severe QSB was present the signal with so called, "selective fading". T received signal exhibited the same reduction strength. Heavy QSB was also noticed. (I a by no means selling the inverted V short. Th antenna for general use and DXing on 75 is s tops with me). Several additional contacts ha been made within a 400 mile radius and t same results by comparison with the regul station antennas has been observed. Furth during nighttime conditions I find that outsi signals are greatly reduced in amplitude a nearby signals are stronger thus aiding grea in QRM reduction.

This antenna might be compared in princip to the driven element of the cubical quad wi the ground acting somewhat as the missing r flector. The great difference being that the sign is radiated skyward rather than toward t horizon. This being the case, it would seem ide that the loop should be mounted .2 waveleng above ground (48′) for the optimum ga figure of the quad antenna. Or perhaps an ev better idea would be to construct a reflector wire and place it below the driven element. T same tuning procedure should apply throu the use of a stub. Placing a field strength me beneath the reflector it should be possible tune the stub for minimum backward radiatio

Another useful innovation of this loop whi I have tried is to open the far end and treat t system as a small rhombic for the higher fr quencies. This worked out most satisfactorily 10 and 15 meter DX contacts even though t antenna was not electrically the proper lengt Incidentally, full wave loops do not have to square in layout. They can be diamond shap or round or what have you and seem to wo equally well. They can also be reduced in si by winding the wire double. I experimented wi one which was only 2 feet on a side and co tained 6 turns. I worked into Detroit (2 mi.) at mid-day and was copied Q5 and S This was only 3 S-units less than the referen antenna. This might show some good promi for mobile and portable installations.

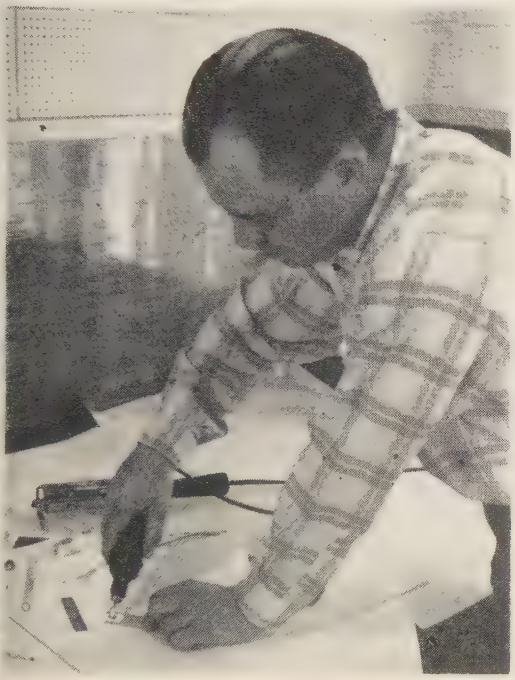
I don't know what you will think of t whole idea, but it won't cost much to try it. you want more solid communication local and want to reduce outstate QRM you shou find this most acceptable.

SOLDERING ON GLASS

[*from page 59*]

cleaning, or pretreatment is used.

When working with such materials as soft glass and ceramics, the best tinning is accomplished with a mixture of Wood's metal and 50-50 indium-tin. However, when soldering glass to glass or ceramics to ceramics, it is necessary to use flame or furnace heating to get enough heat to the surfaces to be joined.



Joseph C. McGuire shows grinder used to buff on solder to glass.

With glass the technique is said to be most satisfactory for fastening electrical connections and similar light work. This also applies to ceramic materials. The process is not intended for fastening problems that might better be handled by a good glue. Failure to deposit a satisfactory coating with Wood's metal on glass indicates that the wheel was too cold when loaded or was not completely loaded with Wood's metal. If rotational speed is too high, the Wood's metal is laid down as a black deposit on the glass and the solder will not adhere. When speed is cut down, a shiny coating can be deposited. ■

Convention in Hawaii

The Annual Hawaiian Territorial Amateur Radio Convention is to be held on the island of Maui July 14 & 15, with a pre-Convention gettogether the night of July 13. Sponsored by the Maui Amateur Radio Club, Hahului, Maui, T. H.

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COLLINS TDO: cold 500w auto-tune xmtr; pr 813's pi-net final; will load any antenna; 2-18 mc, convertib to cover 15 and 10 if desired; CW, tone, A-3 emissio built in Collins phone patch; no TVI; 110/220 inpu complete in Utah; $500 cash; info write box AB, CQ.

"S" METERS for Communicators. No cutting, solderin or disassembling. Also new and used Gonset Commun cators, Linear Amplifiers, VFO's, G-66's, Transmitter etc. Graham Company (W1KTJ), Stoneham, Mas St-6-1966.

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ELL COLLINS 800-cycle mechanical filter for 75A4 5.00 or swap with $10.00 for forthcoming 2.1 kc filter. not use CW. W2MZF.

RAND NEW 10 watt Ship-to-shore phone, 12 volt wer supply, $125.00. ARC-5 transmitters T20, 4-5.3 MC; 1, 5.3-7 MC; with all tubes and crystal. Used $3.50, w $4.50. Power supply for TCS 110/220 AC, 60 cycle th cables $50.00. ATJ television transmitter with all bes $7.50. Cash or trade. John Meshna Jr., 580 Lynn ., Malden 48, Mass.

VAP OR SELL: plug in selectivity, with Collins 3.1 mechanical filter exact duplicate of unit pictured on ge 19 of March 53, CQ. This unit custom made. I nt a variable vacuum condenser rated minimum 7500 V approximately 10 to 400. P. Powell, Medical & Surgical nic. Laredo. Texas.

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[*from page 107*]

things up with me anyway, They're too he and cumbersome, and I can't see through t anyway.

One minute I was atop a wave and into trough on the next, all the time waiting the crash that would denote the end of Yasme . . . and me. Still staring ahead *yes,* there *is* a light there. It's flashing. I r control myself and count the seconds it s off or on . . . which way is it, I just can' member . . . and now I fathom my brai try to think what the light actually does on Island. Is it 5 secs on and 10 off, or is it r the other way . . . is it colored or red? brain was in a turmoil, but the light was th Somehow the flashes weren't regular . . . s were 5 seconds long . . . others 15; the tumbled to it, it was Mr. Laxton wtih his on the Eastern tip of the Island, and I was r on course. Canton Island was exactly w it was put on the chart.

In no time at all I shot into the cabin was screaming incoherently to Howie th had sighted the car lights. I acknowle Mr. Laxton's lights with a series of fla from my mast head light and then told H that I should be in within the next two h

Now, I didn't care about using gas, with the engine going flat out, and all ca pulling we went along like a train. The light from the watery moon permitted m see the reef infested shores. It was as w had stuck on the engine for as soon as I g the lee of the Island I could feel a te current pulling me into the shore. The v swung around and there was quite a t resetting the sails for the new direction of wind. I managed to keep well clear of dangers, even though it was a tough job to well clear of those wicked looking reefs.

Shortly after sighting the car lights the craft beacon popped up to keep me comp so there were plenty of lights then to g me in.

Out of the distance two tiny naviga lights materialized, and slowly the faint line of a tiny launch came toward me. promised, Mr. Laxton, Howie and the Is Manager, Mr. Zvolanek and a fine Gilbe crew were aboard to greet me. Ever clambored aboard while I was still under leaving one man on the launch to guide m In no time at all my sails had been stowed the anchor made ready, with everyone tal at once. Soon the anchor was deeply embe in Canton Island coral.

What a greeting to have from comp strangers! It was only after everything quieted down that I realized the great s I had undergone in those previous few h All I wanted to do was to collapse and s So ended another little trip and another episode in my life.

It was impossible for me to enter the

into the lagoon owing to the 14 knot tidal stream surging through, so we lay there until 7:30 a.m. and then, with the aid of everyone, the anchor was hauled in . . . I should say the anchor chain, the anchor is still in the bottom of the ocean somewhere around there . . . the shackle snapped with the great strain that was put on it at the time. That was the second we had lost in the voyage from home.

Soon we were chugging through the pass straight into the lagoon. With all hands on the lines we soon had the Yasme moored snug and safe alongside the little dock there.

Epilogue

Now, before I complete this little episode let me tell any of you lads and lassies that have the good fortune to contact Howie KB6BA that he is one of the finest fellers I have ever had the good fortune to be associated with. His assistance in getting all my radio gear ashore and set up in his own shack made it possible for me to be on the air with a VR1 license within 24 hours after my arrival on Canton Island. As you can realize, he cannot work his own rig while I am on the air, and that means that during my stay here he will just have to sit back and watch me operate. We are both in the same shack . . . he operating KB6 and I, VR1 . . . rather unique. One evening we both went on the air and as he finished a contact he just passed the chap over to me. . . . I am willing to bet it's the first time in history that those particular hams worked two rare stations all in one go. I expect that W2FSN/2, W8BHW, K6KJQ and W4ZH are feeling quite pleased with themselves over this rare contact. We did not continue with this owing to the time factor, but it was fun while it lasted.

Now, we come to the cream of the whole thing. When I arrived the first thing I saw on the shack table was one of the nicest presents I have seen for many moons . . . A Collins 75A-4 receiver. This had been presented to the Yasme expedition by Art Collins, WØCXX. Many of you lads can thank Art for this as without it I should never have managed to pick you out of the QRM.

I think you will all agree that it was a wonderful gesture. I sincerely hope that with its aid I can do a better job than ever and give many of you a new country. . . . Thank you, Art.

Well fellow Hams and Hammesses, thank you all for your support of this expedition. I have appreciated your good manners over the air, and if things continue this way, there is no reason at all why most of the interested ones shouldn't make QSO with me.

Now, the time has come when I must return to the rig so, until we meet again at the next rare spot . . . 73's, all the best for the future DX.

Danny . . . VR1B . . . at Canton Island, South Pacific Ocean.

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